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POTENTIALS AND REQUIREMENTS OF INCREASING THE DEGREE OF WOOD PROCESSING IN DEVELOPING COUNTRIES OF ASIA AND THE PACIFIC

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This paper was prepared by Horatio P. Brion (Expertise Industrial Corporation, Manila, Philippines) as consultant to the UNIDO secretariat. The views expressed do not necessarily reflect the views of the UNIDO secretariat.

Preface

This study on the wood products sector falls within the framework of UNIDO's research programme on the group of industrial sectors selected for their special importance in the economies of the developing countries. It further constitutes a contribution to the First World-Wide Study on the Wood and Wood Processing Sector.

The mechanical wood processing industry has recently gained a more important role in the economic development strategies of several countries in the Asian-Pacific region. However, while new opportunities are developing for the timber producing countries in the region, adjustments will be necessary fo those countries in which the industry depends on logs supplied by the timber producing countries.

This paper is one of three papers issued by UNIDO which deal with recent developments in wood products sector in the Asian-Pacific region. Its focus is on the prospects and problems of the sector in the developing countries. It was written by Horatio P. Brion as a consultant to the Sectoral Studies Branch. A second paper prepared by Kiichiro Fukasaku, as a consultant to the Regional and Country Studies Branch, concerns the situation of the sector in Japan; it is entitled "Structural Change, Adjustment Problems and Policies Related to the Wood Processing Industry in a 'Timber Deficit' Country, Japan", June 1983. A third paper based mainly on these two is being issued under the title "Prospects and Opportunities in the Mechanical Wood Processing Sector in the Asian-Pacific Region".

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I. THE RESOURCE-BASE, INDUSTRIAL STRUCTURE AND MARKET ORIENTATION OF THE WOOD AND WOOD PRODUCTS INDUSTRY OF DEVELOPING COUNTRIES IN ASIA AND THE PACIFIC[1/]

1. Forest resources

1.1 The resource base

Tropical Asia, as of the beginning of 1981, was estimated to have a cover of approximately 305.5 million hectares of natural woody vegetation (38) classified as follows:

Closed broadleaved forests:	291.9 million ha.
Coniferous forest:	8.4 million ha.
Others (bamboo, mangrove, etc.):	5.2 million ha.

About 57 per cent of the Tropical Asian closed broadleaved forests are found in the Insular Southeast Asian and Pacific countries of Indonesia, Malaysia (Peninsular Malaysia, Sabah and Sarawak), the Philippines and Papua-New Guinea. These four developing countries alone account for roughly 20 billion m^3 of growing broadleaved stock (17), or about 68 per cent of the broadleaved timber stock in the productive closed forests of Tropical Asia. In addition, 37 million m^3 of growing coniferous stock (roughly 4.5 per cent of Tropical Asia's coniferous timber stand) are also found in the productive forests of these four developing countries.

Among the developing countries of South Asia and Continental Southeast Asia, India, Burma and Thailand, also have significant forest resources. These three developing countries account for about 34 per cent of the broadleaved forests in Tropical Asia, with a growing stock of about 6.7 billion m^3 of broadleaved timber species, or roughly 22 per cent of the growing broadleaved stock of Tropical Asia. In addition, these three developing countries have a total growing stock of roughly 497 million m^3 of coniferous timber, which is roughly 60 per cent of Tropical Asia's growing stock of coniferous timber.

1/ This study focusses on South and South/East Asia and the Pacific.

These seven developing countries of Asia and the Pacific, therefore account for roughly 86 per cent of the total forest resources in the region.

Table 1 shows the distribution of forests and growing stock of broadleaved and coniferous timber species in the productive broadleaved forests of Tropical Asia as of the beginning of 1981.

In terms of per caput distribution of growing timber stock (VOB), (see table 2); it appears that among the above-listed seven developing countries, India and Thailand have the lowest volumes of growing timber stock per caput while Papua-New Guinea, Malaysia, Burma and Indonesia have the highest volumes per capita. The Philippines has about 31 m^3 per inhabitant as of the beginning of 1981.

On the basis of an average 60 years growth cycle for broadleaved timber species and Dr. I.A. Fraser's calculated wood consumption for populations of Asian Tropical countries of 0.3 m^3 of roundwood per capita per year (48), it appears that the productive tropical forest resources of India and Thailand are critically below one growth cycle, while those of the other five developing countries significantly exceed one growth cycle.

Thus, in terms of available wood resources alone, Burma, Indonesia, Malaysia, Papua-New Guinea and the Philippines have timber resources potentials which may be available to support expanded activities of their respective wood processing industries. Rough calculations by Brion (44) indicated that the last four countries mentioned above will remain as "TIMBER SURPLUS" countries up to the end of this century. The same scheme of computations indicated that Burma will also remain a "TIMBER SURPLUS" country by the year 2000. Thus, particular attention should be given to these countries (Burma, Indonesia, Malaysia, Papua-New Guinea and the Philippines) in any study on the potentials for accelerated development of the wood processing industry in developing countries of Asia and the Pacific.

TABLE 1. PRODUCTIVE CLOSED BROADLEAVED FORESTS AND GROWING STOCK OF TIMBER IN TROPICAL ASIA
(as of beginning of 1981)

Country	PRODUCTIVE FOREST AREAS (thousands of hectares)					GROWING STOCK (VOB) (millions of cu.m.)				
	Undisturbed	Logged	Managed	Total	% of Tropical Asia	Undisturbed	Logged	Managed	Total	% of Tropical Asia
Broadleaved forests										
Bangladesh	45	10	795	850	0.44	5.5	0.6	62.4	68.5	0.22
Bhutan	860	455	N/A	1,315	0.68	214	47	-	261	0.85
India	4,855	4,033	29,440	38,358	19,99	489	115	1,984	2,588	8.44
Nepal	740	315	-	1,055	0.55	68.7	12.9	-	73.6	0.24
Pakistan	175	45	-	220	0.11	28	2.9	-	30.9	0.10
Sri Lanka	13	1,213	-	1,226	0.64	2.6	73	-	75.6	0.25
SOUTH ASIA	6,718	6,071	30,235	43,024	22.42	800	251	2,047	3,098	10.10
Burma	14,107	5,590	3,419	23,116	12.05	2,536	745	513	3,794	12.37
Thailand	3,915	N/A	-	3,915	2.04	315	-	-	315	1,03
CONTINENTAL SOUTHEAST ASIA	18,022	5,590	3,419	27,031	14.09	2,851	745	513	4,109	13.40
Brunei	270	17	-	287	0.15	81	2.5	-	83.5	0.27
Indonesia	38,915	34,620	40	73,575	38.34	10,311	3,499	-	13,810	45.03
Malaysia	7,529	55,524	2,499	15,552	8.11	2,194	985	556	3,735	12.19
(Peninsular Malaysia)	(1,784)	(3,564)	(459)	(5,807)	(3.03)	(576)	(727)	(119)	(1,422)	(4.64)
(Sabah)	(1,920)	(1,280)	-	(3,200)	(1.67)	(601)	(200)	-	(801)	(2.61)
(Sarawak)	(3,825)	(680)	(2,040)	(6,545)	(3.41)	(1,017)	(58)	(437)	(1,512)	(4.93)
Philippines	3,000	3,700	-	6,700	3.49	915	610	-	1,525	4.97
INSULAR SOUTHEAST ASIA	49,714	43,861	2,539	96,114	50.10	13,501	5,097	556	19,154	62.46
Kampuchea	4,610	510	-	5,120	2.67	1,060	102	-	1,162	3.79
Lao	2,880	N/A	-	2,880	1.50	634	-	-	634	2.07
Vietnam	1,500	2,170	-	3,670	1.91	330	369	-	699	2.28
CENTRALLY PLANNED TROPICAL ASIA	8,990	2,680	-	11,670	6.08	2,024	471	-	2,495	8.14
Papua-New Guinea	13,815	220	N/A	14,035	7.31	1,796	15	-	1,811	5.90
TROPICAL ASIA - TOTAL	97,259	58,422	36,193	191,874	100.00	20,972	6,579	3,116	30,667	100.00
Coniferous forests										
Bangladesh	-	-	-	-	-	-	-	-	-	-
Bhutan	340	170	N/A	510	9.10	94	19	-	113	13.65
India	547	123	2,477	3,147	56.14	84	7.5	379	470.5	56.84
Nepal	145	70	-	215	3.84	17.4	4.2	-	21.6	2.62
Pakistan	250	175	410	835	14.89	61	12	66	139	16.80
Sri Lanka	-	-	-	-	-	-	-	-	-	-
SOUTH ASIA	1,282	538	2,887	4,707	83.97	256	43	445	744	89.91
Burma	88	28	-	116	2.07	13.6	2.8	-	16.4	2.00
Thailand	165	N/A	-	165	2.94	10	-	-	10	1.21
CONTINENTAL SOUTHEAST ASIA	253	28	-	281	5.01	24	3	-	27	3.21
Brunei	-	-	-	-	-	-	-	-	-	-
Indonesia	-	160	-	160	2.85	-	12.8	-	12.8	1.56
Malaysia	-	-	-	-	-	-	-	-	-	-
(Peninsular Malaysia)	-	-	-	-	-	-	-	-	-	-
(Sabah)	-	-	-	-	-	-	-	-	-	-
(Sarawak)	-	-	-	-	-	-	-	-	-	-
Philippines	-	190	-	190	3.40	-	18	-	18	2.19
INSULAR SOUTHEAST ASIA	-	350	-	350	6.25	-	31	-	31	3.75
Kampuchea	4	4	-	8	0.14	0.6	0.3	-	0.9	0.12
Lao	100	N/A	-	100	1.78	10	-	-	10	1.21
Vietnam	100	10	-	110	1.96	8	0.6	-	8.6	1.04
CENTRALLY PLANNED TROPICAL ASIA	204	14	-	218	3.88	19	1	-	20	2.36
Papua-New Guinea	35	15	N/A	50	0.89	4.9	1.3	-	6.2	0.76
TROPICAL ASIA - TOTAL	1,774	945	2,887	5,606	100.00	304	79	445	828	100.00

Source: Forest Resources of Tropical Asia, FAO, 1981.

Table 2. Per capita distribution of wood resources in selected countries of tropical Asia and the Pacific
As of beginning of 1981

Country	1980 Population (million people)	Growing stock (VOB) (million m^3)			Per capita distribution of total growing stock m^3/person
		Broadleaved	Coniferous	Total	
Burma	33	3,794	16.4	3,801.4	115
India	690	2,588	470.5	3,058.5	4
Indonesia	142	13,810	12.8	13,822.8	97
Federated States of Malaysia	13.7	3,735	---	3,735	273
Peninsular Malaysia	(11.3)	(1,422)	---	(1,422)	(126)
Sabah	(1.1)	(801)	---	(801)	(728)
Sarawak	(1.3)	(1,512)	---	(1,512)	(1,163)
Papua-New Guinea	3.1	1,811	6.2	1,817.2	586
The Philippines	50	1,525	18	1,543	31
Thailand	48	315	10	325	7

Source: FAO, Forest Resources of Tropical Asia, 1981.

1.2 Resource management and use

1.2.1 Ownership and policies on exploitation of forests in the region

Forest lands in Indonesia, Bangladesh, Thailand and the Philippines and the centrally planned countries of Asia and the Pacific are nationally owned. Private or public entities in these countries are given the right to exploit the forest lands under contracts for specific periods of time. Almost all timber licenses in the Philippines have been granted to the private sector. Exploitation agreements between the government and the licensees specifically state the terms and conditions covering the manner of exploitation and extraction of timber from the forest lands. The policies of the national government on the development of the forest industry are usually reflected in terms and conditions of use which revolves primarily on the judicious felling of timber in order to preserve the continuity of the forest resources. Provisions in such contracts also require a controlled rate of timber production and calls for the licensee's programme of activities to rehabilitate the exploited areas through reforestation and afforestation, under pain of suspension or cancellation of the license. On the other hand, 90 per cent of the forest exploitation activities in Thailand is carried out by the national government through a corporation wholly-owned by the government. Marketing of the forest produce in Thailand is also conducted by the same public corporation.

In other countries of Asia, such as India, Pakistan and Malaysia, forest lands are owned by the states or provinces composing the federation or union. Forest exploitation policies are generally set and enforced by the state or provincial government, with consultations and advice from the national government. A high degree of autonomy is exercised by the state or provincial government in the management and exploitation of the forest lands within their respective areas.

Ownership of forest lands in Papua-New Guinea is unique among Asian nations. The land and the resources found on and under the land is owned by

the tribes and clans who have settled on the land. Thus, about 90 per cent of the forest lands in Papua-New Guinea belong to numerous tribes or ethnic clans who live in the forest areas. The situation has presented a thorny barrier in the efforts of the national government to rationalize its policies on the use of land and the exploitation of the resources found on the land, for tribal interests do not usually agree with national policies. The national government of Papua-New Guinea has thus promulgated three methods by which its forests resources may be exploited within the terms of the national economic development plans and yet recognizing the rights of tribes and clans to the customarily-owned lands, to wit (17), (27) and (39):

(a) Timber Rights Purchase - This method applies largely to large scale exploitation projects. The national government acquires timber rights (the right of felling, cutting, removing and disposing of the timber) through negotiations with the customary owners. Upon consummation of such Timber Rights Purchase agreements, exploitation permits can then be issued to concessionaries under terms and conditions which conform to national forest policies.

(b) Native Timber Authority - Authority is granted to any person to purchase timber directly from a customary owner upon payment of fees to Forest Inspectors. This applies only to small volumes of timber.

(c) Private Dealings Agreement - Owners of timber by natural custom can dispose of their timber to any person provided the Minister of Forests is satisfied that conditions of the sale conform to national policies. Only a few of this type of agreement have been approved, so far.

Under this scheme, the national government of Papua-New Guinea has launched a huge programme to acquire Timber Rights Purchase from the customary owners, in the hope of attaining better control of the exploitation and use of its forest lands.

1.2.2 Exploitability and legal status of forest lands

Classification of forest lands according to exploitability and legal status differ among countries in Tropical Asia. Classification of the tropical forests in the seven developing countries under study as summarized by Brion (44) is given in Table 3, where accessibility and economic factors (such as cost of harvesting and transport vis-a-vis market price) as of the year 1980 were used in determining the exploitability of the forest area. Various definitions of the legal status of forest lands among the seven countries were grouped as best as could be reconciled, into three categories: reserved, protected and unclassed.

1.2.3 Deforestation, degradation and rehabilitation of forest lands

Huge areas of forest lands have been laid waste by shifting agriculture and abusive tree cutting practices of the mining industry in Asia, until national governments adopted forest conservation, development and management programmes in the late 1960's. The increase in country populations brought about severe pressure for more agricultural land and conversion of timberland to farming, pasturing and other uses which have to be judiciously done without destroying the balance between exploitation and the natural tree growth cycles. Among the developing countries of Asia, Indonesia suffered an appalling amount of deforestation (28-37 million hectares) before a national policy on forest exploitation was formulated, adopted and implemented in the middle of the 1960's (17), (59), (60) and (69). Other Asian developing countries also experienced deforestation but to a lesser degree. As these countries have realized the detrimental effects of uncontrolled exploitation of their forest resources, more rigid rules and regulations have been strictly enforced to control the annual rate of deforestation and keep it at desirable levels. Furthermore, governments of these Asian countries have simultaneously adopted massive forest rehabilitation programmes in an attempt to restore the balance between the natural tree growth cycle and exploitation.

Table 3. Exploitability and legal status of forest lands in selected developing countries of tropical Asia

1980

	Burma	India	Indonesia	Peninsular Malaysia	Sabah	Sarawak	Papua-New Guinea	Philippines	Thailand
A. Total land area (million Has.)	67.6	328.8	191.9	13.2	7.4	12.4	46.0	30.0	52.0
B. Total forest area (million Has.)	32.3	74.8	122.0	8.1	6.3	9.4	36.0	16.7	20.0
1. According to exploitability:									
a) Exploitable	22.5	44,8	45.0	4.1	5.5	8.9	15.0	10.7	15.7
b) Potentially exploitable	0.3	16.3	48.0	2.8	)	0.4	)	1.8	1.9
c) Others	9.5	13.7	29.0	1.2	) 0.8	0.1	) 21.0	4.3	2.4
2. According to legal status:									
a) Reserved	9.5	29.0	47.0	5.3	3.6	3.2	6.2	8.8	16.7
b) Protected	0.5	23.2	48.0	0.8	0.2	2.4	)	0.9	2.9
c) Unclassed	22.3	12.6	27.0	2.0	1.[illegible]	3.8	) 29.8	7.0	0.4

Sources: (3), (6), (11), (13), (14), (18), (20), (27), (28), (29), (30), (36), (44), (59), (69), (74) and (77) of Bibliography.

Some governments, the Philippines, in particular, have even provided financial assistance to encourage timber licensees to plant trees and contribute to the country's forest rehabilitation programme.

The extent of deforestation and the corresponding achievements in forest rehabilitation of selected Asian developing countries are given in table 4, which indicates that forest rehabilitation activities are still way behind deforestation rates in the selected developing countries of Tropical Asia.

1.2.4 Timber production

More than 75 per cent of the estimated 200 million m^3 of round logs annually available in Asia is contributed by the seven developing countries which are subject of this study. Approximately 78.9 million m^3 of this annual potential (predominantly broadleaved species) could be cut into industrial logs to feed sawmills, plywood plants, chipping and pulp mills.

However, the slump in the international wood products market, the rising cost of oil and oil products which is a major cost item in logging and wood processing operations, and the desire of the major Asian timber surplus countries to engage in more processing of their wood harvests have combined to cause actual annual production figures much lower than the above-cited potential harvest figures from 1976 to the present. Table 5 shows the annual log production figures for the seven developing countries under study, vis-a-vis the annual allowable cut of each country.

The expected up-turn of the timber market in 1982 appears to have been delayed. Recent forecasts on the performance of the wood market have been more optimistic, in anticipation of the recently announced improvements in the economy of the United States of America, which are expected to produce a chain reaction of increased demands for wood products in the international market as a result of higher numbers of housing starts in the developed countries of the world.

Table 4. Status of deforestation and forest rehabilitation in selected developing countries of tropical Asia
1980

	Burma	India	Indonesia	Peninsular Malaysia	Sabah	Sarawak	Papua-New Guinea	Philippines	Thailand
A. Deforested area As of 1980 (Converted to agriculture, industrial tree plantations and other use.), thousand hectares	3,300	4,200	32,500	1,000	1,400	3,300	n/a	5,700	5,200
B. Estimated average annual rate of deforestation, 1981 and on, thousand hectares	105	147	600	90	76	89	22	91	252
C. Man made forests (thousand hectares)									
1. Total area planted as of 1980	16	3,300	6,000	200	20	n/a	27	400	300
2. Programmed total area for planting up to year 2000	220	8,440	20,000	500	170	n/a	31	2,000	700

Sources: (3), (6), (11), (13), (14), (18), (20), (27), (28), (29), (30), (36), (44), (59), (69), (74) and (77) of Bibliography.

Table 5. Annual availability and production of industrial logs in selected developing countries of tropical Asia 1976 - 2000 (m^3 million)

	Burma	India	Indonesia	Peninsular Malaysia	Sabah	Sarawak	Papua-New Guinea	Philippines	Thailand
A. Annual availability (Allowable cut) of industrial logs for mechanical processing	3.09	20.0	29.0*	11.0	8.5	10.0	6.0**	16.8	3.5
B. Annual sawlogs and veneer logs production									
1979, actual	1.5	3.4	21.8	10.4	6.1	9.8	0.7	6.6	3.1
1980, actual	1.9	3.4	21.8	10.0	6.7	8.5	1.0	6.3	2.5
1981, estimated	..	..	..	9.5	6.4	8.2	1.3	4.6	..
1982, programmed	..	..	..	8.5	6.5	6.0	1.7	4.0	..
1983, programmed	..	..	..	7.5	..	..	2.4	..	..
1984, programmed	..	..	..	6.5	..	..	3.3	..	..
1985, programmed	..	..	..	6.0	..	..	4.3	..	..
Yearly, thereafter, programmed	..	..	..	5.0	..	..	..	..	..

Legend: * Based on 29,000,000 hectares of Designated Forest Concessions made available up to the year 2000. Additional forest concessions will be made available thereafter.
** Subject to revision as more forest areas are brought under the Timber Rights Purchase Programme of the Papua-New Guinea National Government.
.. not available.
Source: No. 44 of Bibliography.

1.2.5 Future timber supply

The forests of Indonesia, Malaysia and the Philippines have more homogeneous growths of timber species than the forests of the other tropical Asian countries. These three countries have supplied the bulk of the material input requirements of wood processing plants in Japan, the Republic of Korea and the Province of Taiwan. The current wood products market is partial to a few timber species (Philippine Lauan family, Malaysian Ramin and Teak, Indonesian Meranti, Ramin, Keruing and Teak, Thai and Burmese Teak and Indian Padauk, Teak and Rosewood. Consequently, the current manufacturing facilities in Asia are geared to the processing of these species.

In the face of decreasing export of these traditional timber species from the timber surplus countries of Asia, and a possible ban on such exports towards the end of this century, problems will arise in the supply of wood to existing manufacturing facilities in the timber deficit countries of Asia (i.e. Japan, the Republic of Korea and the Chinese province of Taiwan). And as the remaining operable forest areas in Asia will become more heterogeneous in their timber species content, the timber deficit processing countries have taken remedial steps in the following manner:

(a) A recent survey of the Japanese wood processing industry indicated possible use of substitutes (such as American and Canadian fir and Russian pine wood) for the traditionally accepted species. Inquiries have pointed out that the manufacturing technology for the use of such substitutes have already been perfected, and that the large scale use of the substitutes in the wood processing industry of Japan is just waiting for favourable conditions that will allow the economic use of the substitutes;

(b) Research and development facilities in both the timber surplus and timber deficit countries of Asia in the past few years have devoted a major portion of their activities to determining ways and means of using "Commercially-Less-Accepted" species[2/]; and

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2/ Instead of the widely used term "Lesser-Known-Species".

(c) A visible but slow shift of wood processing facilities is now going on from Japan, Republic of Korea and Taiwan Province of wood processing countries of Asia to the developing countries of the area.

1.2.6 Problems in the exploitation of forest resources

Extraction of timber from forests lands has always aimed for maximum yield per unit area of forest land. It has only been during the last 20 or 25 years that countries of tropical Asia which have large forest resources have adopted forest exploitation policies and enforced rules and regulations which are aimed to preserve the continuity of forest growth through selective cutting, and forest rehabilitation activities such as reforestation and afforestation. Only lands allocated for eventual conversion to agriculture or other desirable purposes under the country's economic development programme have been allowed for "Clear Cutting". No timber cutting is allowed in areas declared as protective forests, watershed areas, animal sanctuaries, parks, etc. Some countries have even required timber concessionaires to submit forest protection and rehabilitation programme of activities before they are allowed to cut timber. In addition, implementation of these action programmes are closely monitored such that erring concessionaires are faced with suspension or cancellation of their licenses depending on the gravity of the infraction.

Yet, there are still incidences and practices which threaten the life of forest lands. Hundreds of thousands hectares of forest land have been laid waste by forest fires, either man-made or as a result of weather elements. Shifting agriculture still have to be tightly controlled. More effective measures aimed at adequate forest surveillance and protection still have to be developed and properly implemented. The degree of a country's concern for its forest resources, vis-a-vis the solution of other national socio-economic problems, is measured by the steps the country has adopted to preserve its forests and how effectively they are implemented.

In a way, market demands for specific timber species also contribute to wasteful exploitation of forest lands. Forest inventories of developing countries in tropical Asia have indicated potential increase of at least 10 per cent in yields per hectare of forest land (as those in the more

homogeneous forests of Indonesia, Malaysia and the Philippines) if "commercially-less-accepted" species could also be cut and put on the market. The heterogeneous forests of Papua-New Guinea and West Irian could expect up to a 40 per cent increase in yields for the same reason. Significant amounts of money have been spent and efforts exerted by interested countries to determine the potentials and use of "commercially-less-accepted" timber species. However, the results of these activities still have to be converted into industrial practice and translated in terms of commercial acceptance. Among the countries considered here, it appears that India, by virtue of its short timber supply, has attained more success in the use of "commercially-less-accepted" species.

Another major potential increase in timber yield per hectare of forest land is indicated from studies which show that only a maximum 50 per cent of the standing tree is eventually processed in industrial mills. The remaining 50 per cent (stumps, branches, toppings, etc.) are left to decay on the forest grounds. While there are silvicultural studies which indicate the favourable contribution of the decaying residues to the enrichment of forest soils, other studies have pointed out the dangers of such decay in terms of breeding insect pests and fungi which are disastrous to normal tree growth. In view of the wide variance in local forest conditions, soil and climatology of different forest lands, it appears that more intensive work in this direction is necessary so that man may still benefit from a good part of the residues generated by logging operations.

1.3 The wood and primary wood products industry of China

Among the developing countries in the temperate zone of Asia, the People's Republic of China (PRC) deserves special attention, in view of its huge population and meager forest resources. Its forest areas (50) as of 1980 range from the sub-tropical south-eastern provinces to the temperate areas of the north and northwest, covering 12.7 per cent (approximately 120 million hectares) of the total land area. The standing timber stock volume is roughly 9.5 billion m^3, which amounts to about 10 m^3 per capita. Coniferous species (Chinese fir, masson pine, spruce, larch, Korean pine, etc.) dominate the forests of the northern provinces, while broadleaved species (Chinese mahogany, teak, etc.) abound in the southern forest areas.

1.3.1 Forest exploitation and timber extraction

All forest lands of China are owned by the state. Exploitation and marketing of forest products are done through pertinent agencies of the central government. Timber production for industrial purposes amounted to 46.7 million m^3 in 1980 (42) indicating an average annual increase of 1.4 million m^3 since 1949.

1.3.2 The primary wood processing industry of China

About 40 per cent of the industrial roundwood production of China is converted to sawn-timber. Sawn-timber production in 1980 stood at 13 million m^3 (42). Most of the sawmilling units have equipment dating as far back as the 1950's. This situation is currently being improved with the introduction of more modern technology involving a higher degree of mechanization and semi-automated systems. The technological transformation programme is so huge that it has made possible the development of the sawmilling machinery manufacturing industry in the country. In view of the great distances between China's timber sources and markets, the government has made it a policy to locate the modernized sawmills near forest areas. (74)

As of 1980 only 15-20 per cent of China's sawn-timber production was kiln-dried. Most of the timber sawn into lumber is air-dried or sold as green lumber to end users. This is another aspect of the industry which the PRC government is seeking to improve. Steps are currently being taken to increase drying productivity through the use of more modern lumber seasoning facilities and techniques and the use of more mechanized and automated lumber handling systems. The government of the People's Republic of China has set a goal to kiln-dry 100 per cent of its lumber production. (75)

Another aspect of China's wood industry development programme is the integration of other primary processing (chip, plywood, fibreboard and particle board mills) facilities with sawmilling plants.

In 1980 plywood production in China was 300,000 m^3, produced by small to medium sized mills. Eleven mills have annual capacities of 10-20 thousand m^3

while the smaller plants produce about 5,000 m^3 per year. Blockboard production is also becoming important in the wood-based panel products industry of China. (75)

Fibreboard is produced in small capacity mills (2,000 to 5,000 tons capacity which have proven more appropriate to the Chinese situation). There are more than 200 such small plants with a total capacity of 530,000 tons.

China's particleboard industry is still in its infancy stage, with a total capacity of only 60,000 m^3, although work on the development of the industry with modifications in technology to suit local conditions started in the 1950's. However, Chinese technicians have been very successful in the designing, equipping and operating a mill which produces corrugated particle board roofing sheets out of industrial residues. More accelerated development of this sector of the industry is expected with the significant improvement of the country's synthetic resins industry during recent years.(75)

2. Structure and performance of the wood processing industry

2.1 The primary sector[3/]

Manufacturing activities within the primary sector of the industry in the developing countries of Asia and the Pacific are principally sawmilling and veneer/plywood production. Indonesia leads in the manufacture of veneer and plywood with a total installed annual capacity of 2,693,000 m^3 in 3 veneer and 34 plywood plants (in 1980). Latest reports indicate that in 1982 there are 46 plywood and veneer plants (with an estimated total capacity of 3,500,000 m^3) in operation as of 1982 (68). More plants are programmed to be erected in the coming years for a total of about 90 plywood and veneer plants having an estimated capacity of over 45 million m^3 of veneer and plywood products by 1985. In addition, applications for another 88 plants (with an estimated 4 million m^3 capacity) are now under consideration by

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3/ This analysis excludes China.

the Office of the Director General of Forestry. The Philippines and Malaysia in an effort to encourage more advanced wood processing activities have not programmed for any new sawmill or plywood/veneer plants. Both countries, however, would allow the modernization and/or expansion of existing sawmill and plywood plants. While the material recovery rates of plywood plants in Japan, Korea and the Chinese Province of Taiwan are most usually above 50 per cent Table 6 shows that those of the developing countries under study are mostly below 50 per cent, bringing to fore the need for better skills and more efficient technology in the developing countries.

The sawmilling industry in the developing countries under study (Table 6) includes various types of operation ranging from circular sawmilling outfits employing less than 20 workers to fully mechanized bandmills furnished with modern material conveying systems. Some of the big sawmilling units operating kiln-drying facilities even have automatic lumber stacking machines with output capacities of more than 200 m^3 of sawn-timber per day. Yet, a majority of these sawmilling plants, particularly the smaller units, operate at very low efficiencies and plant utilization levels. The lumber yield rates are well below those of the more industrialized wood processing countries (Japan, Korea and the Chinese Province of Taiwan) which attain sawmilling yield rates as high as 65 to 70 per cent through the use of more efficient bandmills and highly improved sawmilling technology. The problem of sawmilling residue disposal is universal among the sawmilling plants of the developing countries under study.

It can be gleaned from Table 6 also that the particle board and fibreboard manufacturing industries have not developed to the same extent as the plywood and veneer industry among the seven countries under study, presumably due to their high capital requirements. Except in Indonesia and Papua-New Guinea, most of the developing countries have assigned a lower priority to the wood industry against other industries considered more important in the economic development programmes of the respective countries. In view of the usually meager amount of capital available for industrial development in developing countries, the trend therefore would be to allocate development funds to industries which require less capital to develop (viz those other than the fibreboard and particle board industries).

TABLE 6. MANUFACTURING PLANTS, CAPACITIES AND PRODUCTION PERFORMANCE
PRIMARY WOOD PROCESSING SECTOR OF SELECTED TROPICAL ASIAN COUNTRIES
1980 - 1981

	Burma	India	Indonesia	Malaysia	Papua-New Guinea	Philippines	Thailand
I. SAWN TIMBER							
A. Number of sawmilling plants (units)	N/A	N/A	3,426	731	65	200	493
B. Total installed sawmilling capacity based on cubic meters of log input (x 1,000 cu.m.)	N/A	N/A	10,000	12,300	202	4,715	8,500
C. Actual annual production (x 1,000 cu.m.)							
1980	415	3,639	4,797	5,000	103	1,529	2,544
1981	415	3,639	6,250	N/A	N/A	N/A	2,400
D. Typical daily operating schedule, 8-hr shift, no. of shifts/day	N/A	N/A	1	1	1	1	1
E. Typical mill utilization based on percent installed mill capacity	N/A	N/A	60%	65%	33%	33%	33%
F. Estimated average sawn timber yield rate, % log input	N/A	N/A	48%	40%	45%	50%	42%

	V	P	V	P*	V	P	V	P	V	P	V	P**	V	P
II. VENEER/PLYWOOD														
A. Number of mills (units)	0	3	0	145	3	34		43	3	1	9	26	10	8
B. Total installed processing capacity based on log input (x 1,000 cu.m.)	0	32	15	450	400	2,293		2,500	90	32	941	3,486	48	220
C. Actual annual production (x 1,000 cu.m.)														
1980	0	12	3	200	37	1,011		596	1.5	16.5	660	553	15	80
1981	0	12	3	280	N/A	1,544		630	1.0	15.0		N/A	15	80
D. Typical daily operating schedule, 8-hr shift, no. of shifts/day	0	2	1	2	2	2		2	2	2	3	3	1	2
E. Typical mill utilization, based on % installed mill capacity	0	65%	33%	65%	50%	65%		65%	65%	65%	70%	25%***	33%	67%
F. Estimated average yield rate, % log input	0	48%	47%	45%	45%	55%		42%	45%	45%	55%	53%	48%	45%

III. PARTICLE BOARD								
A. Number of mills (units)	NIL	9	1	2	NIL	2****	2	
B. Total installed production capacity	NIL	64,100 t/yr	30 t/d	8,000 m^3/yr	NIL	100 t/d	100 t/d	
C. Typical daily operating schedule, 8-hr/shift, no. of shifts/day	NIL	2	N/A	2	NIL	NIL	3	
D. Typical mill utilization based on % installed mill capacity	NIL	40%	N/A	50%	NIL	NIL	50%	
E. Total actual annual production	NIL	21,000 m^3/yr	N/A	2,000 m^3/yr	NIL	NIL	9,000 m^3/yr	

IV. FIBREBOARD							
A. Number of mills (units)	NIL	3	1	NIL	NIL	1*****	2
B. Total installed production capacity	NIL	53,000 t/yr	3,000 m^3/yr	NIL	NIL	265 t/d	265 t/d
C. Typical daily operating schedule, 8-hr/shift, no. of shifts/day	NIL	2	1	NIL	NIL	3	3
D. Typical mill utilization based on % installed mill capacity	NIL	40%	33%	NIL	NIL	85%	45%
E. Total actual annual production	0	32000 m^3/yr	1,000 m^3/yr	0	0	69,000 m^3/yr	30,000 m^3/yr

Legend: V - Veneer
P - Plywood
* - Includes about 100 units in the small scale sector of the plywood industry, per K.S. Nair, Executive Director of the Federation of Indian Plywood and Panel Industry.
** - Excluding blockboard plants
*** - Reflects poor market conditions
**** - One mill converted to Oriented Strand Board Plant, now on trial run. Other mills not operating
***** - Hardboard plant, another mill (MDF) under construction.

Source: No. 44 of bibliography.

It will be noted that plywood manufacturing requires comparatively lower capital outlay and less expenses in training labour than the other wood-based panel plants.

2.2 The secondary wood processing sector

A general description of the secondary wood processing industries of developing countries in Asia may be summarized with the following characteristics:

(i) Except for a few cases, as in Singapore and the more industrialized provinces of China, the industry is highly fragmented --principally made up of small family-owned and -operated shops employing less than 10 workers-- and with widely ranging sizes up to units which are mechanized and conveyorized, employing more than 300 workers and processing up to 750 m^3 of wood per month into furniture items, builders' woodworks, case goods, etc.;

(ii) Correspondingly, the technology varies from hand tools to fully-mechanized and conveyorized factories equipped with basic and specialized woodworking machinery;

(iii) Product specialization and serial production (except in China) exist only in export-oriented factories;

(iv) Most usually, basic woodworking machinery is normally only found in factories which cater to the needs of the upper, middle and higher-income segments of the population (except in countries with centrally planned economies) and these are used more as tools rather than industrial production machines;

(v) Quality levels of products correspond to the minimum quality levels acceptable in the domestic market and are much lower than for those produced in industrialized countries;

(vi) The use of inadequately seasoned lumber predominates, leading to low-grade workmanship, faulty joinery and poor surfacing, which prevents the production of interchangeable component parts of the woodworks product;

(vii) Inadequate land transportation systems and other infrastructure has caused the concentration of furniture and woodworks plants around big urban centers: The supply of such products for the more remote and smaller communites comes from small family-owned, family-operated ships;

(viii) Poor machinery lay-out, undesirable housekeeping practices and antiquated production techniques combine to cause low productivity;

(ix) The techniques of formal packaging of furniture and woodworks products in developing countries have not developed to a point which could help decrease the transportation cost of the finished product. Deliveries are commonly based on assembled products or sub-assemblies which are completely assembled at customer's site;

(x) The costs of industrial supporting infrastructure (power generation, water supply, compressed-air systems, industrial residue disposal systems, machine repair and tool grinding facilities, etc.) are usually beyond the financial capabilities of the small and medium size shops, so that proper use and timely repair of whatever available machinery is not attained, and productivity is lower than what it should be, thus keeping production costs at high levels;

(xi) Competent designers and product engineers are hardly available for the furniture and woodworks industry of the country;

(xii) Benefits that may be gained from the results of research and development activities within or outside of the developing

country are seldom realized as a majority of the entrepreneurs do not have the technical and/or financial capability to implement such research findings;

(xiii) Up-to-date, reliable data on the secondary wood processing sector are very scarce for most developing countries.

2.2.1 Status of the secondary wood processing in selected Asian developing countries

Burma

The furniture and woodworks industry of Burma is a typical example of the industry in a developing country. There are no less than 900 manufacturing units, about 95 per cent of which belong to the small size group of the industry (51). All the characteristics enumerated in section 2 of this paper may be used to describe the secondary wood processing industry of the country.

However, the country has lately realized the economic potential of a well-developed furniture industry which is capable of being supplied with the required wood material (Burmese Teak) which has been a prime forest products export of the country. The country has turned to external sources (Japan) to help its furniture manufacturing industry. The details of this arrangement are presented in a later chapter of this document.

China

As of 1980, the Chinese secondary wood processing industry was composed of at least 3,000 furniture and woodworks plants employing approximately 290,000 workers (46, 75). About 90 per cent of the industry's output is sold in the domestic market.

Under the centrally planned economic programme of the country, the industry has responded very well to modernization and expansion plans. Serial production of secondary wood products has become a general feature of the industry. Such expansion and modernization activities are adequately backed up by a system of research and development centers located in metropolitan

centers of the country (Beijing, Shanghai, Guanchow, among others). The government has encouraged furniture manufacturers to shift to the production of panel-based furniture products and provided adequate sources of the basic material supply through the establishment of more than 200 units of wood-based panels manufacturing plants. Another step towards development of the industry, encouragement of product specialization, has been launched with an eye on the export market.

India

Reliable statistics on the secondary wood processing sector of India are not readily available. G.C. Saha (64) estimates the industry to be composed of around 30,000 furniture and joinery manufacturing units, 95 per cent of which employ not more than 5 workers. Total employment of the industry is placed at 150,000 workers. Only about 1 to 2 per cent of the industry units employ more than 10 workers. However, more recently, the central government of India has placed more emphasis on the development of its secondary wood processing industry, by providing specific incentives for the establishment of manufacturing units especially in areas declared "BACKWARD" under the country's economic development programme. Export of India's furniture and joinery products is still minimal.

Indonesia

No official record is available on the number of furniture and woodworks plant in Indonesia. Industry leaders have estimated the industry composition at about 4,000 furniture and woodworks plants, with at least 90 per cent belonging to the small-scale industry group. At most 10 per cent of the industry is mechanized (34, 35, 44, and 47), and 20 firms at most (majority of which are in the Pulogadong Industrial Estate, Jakarta) are engaged in serial production of furniture, joinery and woodworks items. These plants are concentrated in the urban centers of Java and Sumatra. Except for very few firms in Java, product quality is still low and could hardly be acceptable in the international market. The industry sector is represented by the Indonesian Woodworks Manufacturers Association, with head offices in Jakarta.

Malaysia

Not much is known about the secondary wood processing sectors of Sabah and Sarawak. However, Peninsular Malaysia has reported 900 furniture and joinery manufacturers, about 90 per cent of which belong to the small-scale industry group. The industry leaders estimated less than 25 firms engaged in the serial production of furniture, joinery and other woodworks products. These are located in Kelang, Selangor and the industrial estates around Kuala Lumpur. The industry is represented by the Furniture Manufacturers and Traders Federation of Malaysia, with headquarters in Kuala Lumpur.

Papua-New Guinea

Among the countries under study, Papua-New Guinea has the smallest secondary wood processing industry. There are 41 firms producing wood furniture and furnishings. Another 37 firms are engaged in the manufacture of components for pre-fabricated housing units, joinery and other builder's woodworks. All of these establishments are found in urban centers such as Port Moresby, Lae, Goroko and Wewak. More recently, the Forest Industries Council of Papua-New Guinea, which had primarily concerned itself with the development of the forestry and primary wood processing sectors of the industry, took steps to help the development of the secondary wood processing industry through the aid of UNIDO.

Philippines

Industry data on the Philippine furniture and joinery industry are not readily available from official government sources. Industry leaders, through the Chamber of Furniture Industries of the Philippines (with a membership of 300 manufacturers and a handful of suppliers) estimated a total of more than 2,000 shops concentrated around urban centers all over the archipelago (12). Approximately 75 per cent of the industry are shops belonging to the small-scale industry group. Not more than 50 firms, most of which are in the rattan furniture industry, are engaged in serial production. The industry has gained a foothold in the international market, predominantly in the rattan furniture sector of the market.

Thailand

The Thai Furniture Industries Association has reported about 400 furniture and woodworks factories in the country as of 1980 (19, 44). Half of these establishments are concentrated in the Bangkok area. More than 50 per cent of the manufacturing units belong to the small-scale industry group, each employing less than 15 workers, using a few motorized hand tools and some basic woodworking machinery (planers, radial saws, routers, etc.). Not more than 10 factories are fully mechanized and export their products, which amounts to about 25 per cent of the total output of the industry in Thailand, including part of the output of 70 rattan furniture factories.

2.3 Needs for the development of the secondary wood processing industry of developing countries in Asia

Rationalization of development plans for the secondary wood processing sector in Asian developing countries is made difficult because of the following facts:

(i) Its highly-fragmented nature and the lack of reliable and up-to-date information on the industry prevent an in-depth study of the industry.

(ii) Only 5 to 10 per cent of the industry's component manufacturing units possess good potential for modernization and/or expansion. A majority of the existing medium scale units, and most probably all of the small scale units, do not possess the technical and financial capabilities to support expansion and modernization activities geared to put them on equal footing with the bigger production units of the industry and, thus, attain potential for export purposes.

In general, the following characteristics are possessed by those firms which have potential for development to levels comparable to those of industrialized countries:

(i) The firm already possesses the basic technology for serial production of furniture or other woodworks products, in terms of an adequate complement of basic woodworking machinery and production techniques; kiln-drying facilities and limited use of production jigs and fixtures.

(ii) Basic concepts of production management are already in use in these factories, including inventory control, rudimentary quality control activities and basic production scheduling for the serial manufacture of diversified lines of wood products.

(iii) These factories are accessible to ports served by international shipping lines.

However, these establishments, in order to develop further, need assistance as follows:

(i) Financial assistance in the acquisition of additional machinery and fixtures and better technology (through hiring foreign experts of the industry) which are needed to increase production capacity, improve the flow of materials-in-process and increase productivity to desirable levels.

(ii) Training of key production, technical support, supervisory and management personnel to enable them to cope with the problems attendant to high volume and quality production operations.

(iii) Technical assistance in the marketing of their products.

(iv) Technical assistance in the design of the wood products to allow serial production at the lowest possible cost, using available indigenous materials to the fullest possible extent.

A great majority of the secondary wood processing firms are small or medium size enterprises. Individually, they do not have the financial capability to contract the services of consultants or experts to provide the

technical, managerial and financial advice they badly need. Government assistance in the form of industrial extension services, dispensed by adequately trained officers, is indicated. Their work programme could be similar to that undertaken by agricultural extension officers. Initially, this is expected to provide impetus to efforts to improve the industry in a way that the characteristic "secretiveness" and "inward-orientation" of the small and medium entrepreneurs will be softened and hopefully erased later, for like his agricultural counterpart, the industrial extension officer will be working as a member of the industrial community. Thus, the small and medium scale entrepreneurs will become more open to suggestions for improvement, and be more convinced of the potential benefits therefrom. Other specialists who will be made available from time to time by the industrial extension office will thus be able to influence the shift from "artisanal" to industrial methods of production. There are also other benefits to be gained from the services of the industrial extension office, the more important of which are:

(i) It will gather reliable and up-to-date feed-back information about the industry, the lack of which has currently prevented the formulation of sound development programmes for the industry branch.

(ii) It makes possible close and regular monitoring of the progress attained by the development work.

(iii) It will also provide a source for immediate advice on minor technical and management problems that surface during daily operations of the small and medium enterprises.

2.4 Industries allied to wood processing

The chances for success of development programmes for the wood processing industry in a developing country are enhanced by a corresponding growth in some of the allied industries that supply major raw materials (other than wood) and services common to other industries of the country. These allied industries and services would otherwise be a heavy financial undertaking and it may not be justified to establish them for each wood processing plant.

For example, the growth of the synthetic resin industry (if it already exists in the country) would be a tremendous boost to the growth of the wood-based panel industry in a developing country. Development of the metalworking, adhesives, plastic sheeting and paint/coatings industries is desirable to keep the secondary wood processing sector supplied with hardware, fittings, fasteners, upholstery materials, adhesives and paint/coating materials at hopefully lower costs than the corresponding imported items. Development of the abrasives manufacturing industry would provide both the primary and secondary wood processing sector with the sanding belts and other industrial abrasives that are necessary to the wood processing industry. And, of course, it would be desirable if woodworking machinery could be produced locally to suit conditions in the developing country.

Machine shops and cutting tools/blades grinding facilities are major components in the capital outlay for wood processing factories. These supporting services also cost much to operate for they require highly skilled personnel and expensive tools and supplies. Regrettably, however, these service facilities, as found in existing wood processing factories in developing countries, are not fully utilized for their capacities greatly exceed the needs of the factory. Thus, it would be of economic advantage to the industry if such facilities are encouraged to be established as a common service to a number of wood processing plants located in the same area.

To date, the synthetic resins and paints/coatings manufacturing industries in the Philippines, Thailand, India and China have developed to a level capable of giving adequate supply to existing wood processing industries. Further growth of the wood processing industries in these countries is encouraged by the growth of these two allied industries.

India and China have well developed plastic sheeting and metalworking industries which could meet the needs for upholstery materials, hardware, fittings, fasteners and nails of their wood processing industries.

All the developing countries under study, except for Papua-New Guinea, Malaysia and Indonesia, have ample machine shop service facilities. However, it appears that among the developing countries only the Philippines has

developed a tool grinding service network to a level capable of further growth to meet the needs of further development of its wood processing industry.

All the developing countries still have to import a great portion, if not all, of their needs for abrasives and cutting blades (saw, knives, bits etc.).

3. Market orientation

3.1 Log trade

Indonesia, Malaysia (including Sabah and Sarawak), and the Philippines have been the major exporters of sawlogs and veneer logs during the last five years. Papua-New Guinea has gradually increased its log exports so that its log exports matched the Philippines log exports by 1981. Among the countries under study only Papua-New Guinea has revealed its log export programme up to the end of the century (39) (see table 8). Japan has been and still is the top importer of logs from the Asian and Pacific region, accounting for about 82 per cent of the total log exports of the region. The European Economic Community (EEC) ranks second, importing approximately 16 per cent of the region's log exports (see table 8).

However, it will be noted that the total log exports from the "timber surplus" developing countries under study have been decreasing significantly since 1980. This decline in log exports may be attributed to two major factors: a) the poor conditions of the world market for wood and wood products, and b) the restrictions (in Indonesia, Sabah, Sarawak and the Philippines) and ban (in Peninsular Malaysia) of log exports. The Philippines has planned for a total ban of log exports eventually. The log export restriction or ban imposed by these "timber surplus" countries have been imposed as a consequence of their efforts to encourage domestic processing of their timber production.

3.2 Sawn-timber trade

In general, the region's sawn-timber exports have shown a gradual increase during the last five years (see table 7) with the EEC countries

Table 7 Exports of wood and wood products from selected Asian countries

	Burma	China	India	Indonesia	Malaysia	Papua New Guinea	Philippines	Thailand
A. Sawlogs/Veneer logs (x 1 000 m^3)								
1976, actual	57	69	39	18 105	15 505	445	2 331	49
1977, actual	62	69	32	18 932	16 118	402	2 047	32
1978, actual	77	69	32	19 457	16 722	445	2 200	17
1979, actual	85	69	30	18 161	16 100	445	1 248	1
1980, actual	82	69	30	15 182	15 462	642	715	1
1981, actual	N/A	N/A	N/A	6 216	14 928	744*/	708	N/A
1982, actual	N/A	N/A	N/A	N/A	N/A	1 360*/	752	N/A
1983, programmed	N/A	N/A	N/A	N/A	N/A	2 060	1 480	N/A
1984, programmed	N/A	N/A	N/A	N/A	N/A	3 020	N/A	N/A
1985-2000, estimated (annual)	N/A	N/A	N/A	N/A	N/A	4 100	N/A	N/A
B. Sawn-timber (x1 000m^3)								
1976, actual	74	167	18	656	3 088	51	493	101
1977, actual	63	121	6	594	2 993	51	455	52
1978, actual	56	153	6	757	2 827	47	573	16
1979, actual	98	153	2	1 322	2 973	47	915	7
1980, actual	118	153	2	1 130	3 148	47	742	3.5
1981, actual	N/A	N/A	N/A	1 116	2 540	N/A	789	N/A
1982, actual	N/A	N/A	N/A	N/A	N/A	N/A	476	N/A
1983, programmed	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
1984, programmed	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
1985-2000, target (annual)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
C. Plywood (x 1 000m^3)								
1976, actual	0	869**/	33	13	407	11	260	11
1977, actual	0	945**/	15	14	344	6	340	5
1978, actual	0	1 240**/	15	85	410	6	383	1
1979, actual	0	1 240**/	7	116	432	6	406	2
1980, actual	0	1 240**/	7	283	423	6	322	2
1981, actual	N/A	N/A	N/A	540*/	461	N/A	352	N/A
1982, actual	N/A	N/A	N/A	1 595*/	N/A	N/A	255	N/A
1983, programmed	N/A	N/A	N/A	2 320	N/A	N/A	N/A	N/A
1984, programmed	N/A	N/A	N/A	3 900	N/A	N/A	N/A	N/A
1985-2000, programmed	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
D. Veneer (x 1 000m^3)								
1976, actual	0	2	1	0	170	5	50	7
1977, actual	0	2	4	0	208	2	36	8
1978, actual	0	4	4	0	185	3	31	12
1979, actual	0	4	3	0	124	3	50	8
1980, actual	0	4	3	0	127	3	63	8
1981, actual	N/A	N/A	N/A	N/A	N/A	N/A	96*/	N/A
1982, actual	N/A	N/A	N/A	N/A	N/A	N/A	98*/	N/A
1983, programmed	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
1984, programmed	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
1985-2000, programmed	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

Sources: FAO Yearbook of Forest Products, 1980
National Census and Statistics Office, Manila, Philippines

*/ = Programmed

**/ = Includes Taiwan output

N/A = Not available

Table 8 Market distribution of primary wood and wood products exported from selected developing countries of Asia and the Pacific

1980 (x 1 000 m^3)

	Burma		China		India		Indonesia		Malaysia		Papua New Guinea		Philippines		Thailand	
	Qty.	% of Total	Qty.	% of Total	Qty.	% of Total	Qty.	% of Total	Qty.	% of Total	Qty.	% of Total	Qty.	% of Total	Qty.	% of Total
A. Veneer logs/Sawlogs																
Japan	47	58	N/A	N/A	N/A	N/A	8 613	25.8	6 693	43.0	462	71.5	471	65.8	0.36	36.0
Republic of Korea	0	0	N/A	N/A	N/A	N/A	*	*	1 116	7.2	107	16.6	53	7.4	N/A	N/A
China	0	0	N/A	N/A	N/A	N/A	*	*	*	*	*	*	*	*	N/A	N/A
Other Asian countries	21	26	N/A	N/A	N/A	N/A	5 477	16.4	3 513	22.7	61	9.5	140	19.6	0.14	14.0
EEC Countries	14	16	0.7	1.0	N/A	N/A	92	0.3	3	0.02	10	1.5	50	7.0	0.12	12.0
Other European countries	0	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	6	0.9	1.5	0.2	N/A	N/A
Middle East countries	0	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0	0	0	0	N/A	N/A
U.S.A.	0.11	NEG	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0	0	0.2	0.1	N/A	N/A
Canada	0	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0	0	0	0	N/A	N/A
Australia	0	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0	0	0	0	N/A	N/A
African Countries	0	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0	0	0	0	N/A	N/A
Total exported	82		69		30		15 182		15 462		646		715		1	
B. Sawn-timber (air-dried and kiln-dry)																
Japan	0.7	0.6	N/A	N/A	N/A	N/A	91	8	2.7	NEG	27.2	58	198.8	27	2.6	74
Republic of Korea	N/A	N/A	N/A	N/A	N/A	N/A	11	1	0.1	NEG	N/A	N/A	0	0	N/A	N/A
Malaysia	N/A	N/A	N/A	N/A	N/A	N/A	125	11	0	0	0	0	0	0	N/A	N/A
Other Asian countries	17	14.4	N/A	N/A	N/A	N/A	N/A	N/A	1 079	34	N/A	N/A	NEG	NEG	0.1	4
EEC countries	13.1	11.1	N/A	N/A	1.9	95	455	40	1 063	34	2.5	5	0.4	NEG	0.4	10
Other European countries	N/A	N/A	N/A	N/A	N/A	N/A	6	0.6	35	1	0.4	1	62.5	8	N/A	N/A
U.S.A.	2.9	2.5	N/A	N/A	N/A	N/A	13	1	31	1	N/A	N/A	79.9	11	0.4	1/2
Canada	N/A	N/A	N/A	N/A	N/A	N/A	0.3	NEG	0.7	NEG	N/A	N/A	3.7	0.5	N/A	N/A
Australia, New Zealand and Oceania	N/A	N/A	N/A	N/A	N/A	N/A	1.7	NEG	106.9	3	15.3	33	69.1	9	N/A	N/A
Middle East countries	N/A	N/A	N/A	N/A	N/A	N/A	9.7	0.8	536	18	0	0	0.6	NEG	N/A	N/A
African countries	N/A	N/A	N/A	N/A	N/A	N/A	0	0	36	1	0	0	9.8	1	N/A	N/A
Total exported	118.0		153.0		2.0		1 130.0		3 148		47		742		3.5	
C. Plywood																
Japan	NIL	NIL	N/A	N/A	N/A	N/A	9	3.1	2	0.6	0	0	0.1	NEG	0.01	1
China	NIL	NIL	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0	0	N/A	N/A	N/A	N/A
Other Asian countries	NIL	NIL	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0	0	N/A	N/A	0.2	8
EEC countries	NIL	NIL	N/A	N/A	N/A	N/A	31	10.9	78	18.7	0	0	99.8	31.0	0.4	19
Other European countries	NIL	NIL	N/A	N/A	N/A	N/A	N/A	N/A	2	0.4	0	0	0.1	NEG	N/A	N/A
African countries	NIL	NIL	N/A	N/A	N/A	N/A	N/A	N/A	7	1.6	0	0	136	42.3	N/A	N/A
U.S.A.	NIL	NIL	N/A	N/A	N/A	N/A	26	9.2	6	1.3	0	0	N/A	N/A	N/A	N/A
Canada	NIL	NIL	N/A	N/A	N/A	N/A	N/A	N/A	0.5	0.1	0	0	3.1	0.95	N/A	N/A
Other American countries	NIL	NIL	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0	0	N/A	N/A	N/A	N/A
Australia, New Zealand and Oceania	NIL	NIL	N/A	N/A	N/A	N/A	1	0.2	1.6	0.4	6.5	0	2	0.31	N/A	N/A
Middle East countries	NIL	NIL	N/A	N/A	N/A	N/A	18	6.3	47	11.3	0	0	N/A	N/A	N/A	N/A
Total exported	NIL		1.2		0.007		283		423		6.5		322		2.0	

Sources: European imports of tropical hardwoods, U.N.T.C., E.E.C.,
Tropical forest products in world timber trade, FAO, 1980

* = included in "Other Asian countries"
N/A = not available

(28 per cent) and Singapore (21 per cent) as the major importing countries of the product (see table 8). The recently increasing imports of sawn-timber by Middle East countries (10 per cent of the exports as of 1980) is very significant since it indicates a new market for the region's wood products. Japan and the Republic of Korea are also major importers of the region's sawn-timber, their combined imports amounting to about 16 per cent of the region's total exports of sawn timber.

Approximately 47 per cent of the region's total sawn wood trade was within the region itself.

3.3 The plywood trade

The EEC countries (18 per cent), the Middle East countries (15 per cent) and Hong Kong (13 per cent) are the major importers of plywood (including blackboard) from the developing countries under study, as of 1980 (see table 8). The Philippines and Malaysia have significant exports of plywood to the African region. Lately, however, Indonesia has shown a tremendous acceleration in the development of its plywood manufacturing industry, exporting (in 1982) more than double its exports in 1981. It appears that among the developing countries of the region, Indonesia will be the major exporter of the plywood in the coming years, probably up to the first decade of the next century. (68).

It is significant that Japan imports only 1 per cent of the combined plywood exports of the countries under study.

Plywood trade among Asian countries, as of 1980, accounted for 28 per cent of the region's total trade.

3.4 Veneer and other wood-based panels

The export of veneer sheets and other wood-based panels from the countries under study are not as well developed as plywood exports. Malaysia is the major exporter of veneer sheets, followed by the Philippines.

Exports of other wood-based panels from the countries under study are negligible. Particle board and fibreboard output of these countries is principally for domestic consumption. It is noteworthy that India and China, the most populous countries in the world, have developed particle board and fibreboard industries to suit local conditions.

3.5 Secondary wood products exports

Recently, the export of secondary wood products has received accelerated impetus in the Philippines, Malaysia, Indonesia and Thailand. Malaysia and the Philippines are the front-runners in the export of wooden furniture and components (see tables 9 and 10). The growth in exports has been very remarkable since 1978. Latest reports indicate more accelerated growth of furniture and furniture parts exports from these countries in the coming years, under their programmes for greater domestic processing of their timber outputs.

Table 10 also shows that Japan imports only 13 per cent of its total imports (US $167 million in 1981) of wooden furniture from the developing countries under study. It is a net importer (by US $74 million in 1981) of wooden furniture and parts (see table 11). This fact is also of great significance since it points to the potential of secondary wood products manufacturing as a medium for further co-operation between Japan and the developing countries under study.

Table 10 also shows that Japan imports only 20 per cent of its rattan furniture and parts from the developing countries under study, in spite of the fact that Indonesia, Malaysia, the Philippines and Thailand are major sources of rattan poles in the tropical Asian region. Taiwan province, Korea, Hong Kong and Singapore supply 80 per cent of Japan's imports of rattan furniture parts.

TABLE 9 EXPORT OF FURNITURE AND OTHER SECONDARY FOREST PRODUCTS FROM SELECTED ASEAN COUNTRIES, 1978 - 1980
(thousands of dollars, FOB country port)

Products	INDONESIA			MALAYSIA			PHILIPPINES		
	1978	1979	1980	1978	1979	1980	1978	1979	1980
1. WOODEN PRODUCTS									
A. Wooden furniture and furnishings	1,707	3,380	5,016	12,350	15,600	14,750	2,849	7,402	7,826
B. Wooden mouldings and beadings	5,653	2,072	2,704	44,390	60,239	69,707	875	1,470	535
C. Other builders woodworks and joinery products	1,420	2,623	991	193	182	617	14,500	20,284	15,412
D. Wooden boxes	-	-	-	6	14	418	94	148	227
Total wooden products	8,780	8,075	8,711	56,939	76,035	85,492	18,318	29,304	24,000
2. CANE (RATTAN) PRODUCTS									
A. Rattan and cane poles	22,412	58,173	57,424				NIL	NIL	NIL
B. Other rattan items, unprocessed	4,853	16,646	18,882				NIL	NIL	NIL
C. Rattan furniture and components	-	-	1,186				14,763	30,332	41,979
D. Rattan matting	2,185	6,724	7,608				NIL	NIL	NIL
Total rattan products	29,423	81,543	85,100	NIL	217	365	14,763	30,332	41,979
3. BAMBOO AND BURI FURNITURE	NIL	NIL	NIL	NIL	NIL	NIL	8,975	17,100	27,288
4. TOTAL SECONDARY WOOD PRODUCTS	38,203	89,618	93,811	56,939*	76,252	85,857	42,056	76,736	93,267
5. % INCREASE OVER PREVIOUS YEAR	N/A	135	5	N/A	34	13	N/A	82	22

Legend: N/A - not available; * - Excluding rattan products

Source: CFIP, 1980 Export Performance of the Philippine Furniture Industry, Chamber of Furniture Industries of the Philippines, Manila, 1981
AFIA, The 6th Convention of the Association of Furniture Industries of Asia, The Furniture Manufacturers and Traders Federation of Malaysia, 22 October 1980.
AFIA, The 7th Afia Convention, The Indonesian Woodworks Manufacturers Federation, October 1981.

Table 10 Japanese trade of furniture and parts with selected Asian and Pacific developing countries, 1981

(x US$ 1,000)

Country	Wooden furniture and parts	% of Japan Total	Rattan furniture and parts	% of Japan Total
Japan totals				
Export	397,771	100	0	100
Import	(515,035)	(100)	(203,030)	(100)
Net Export (Import)	(117,324)		(203,030)	
A. Burma				
Export	24	0.01	0	0
Import	(0)	(0)	(0)	(0)
Net Export (Import	24		0	
B. China (Excluding Taiwan)				
Export	689	0.17	0	
Import	(17.731)	(3.44)	2,625	1.29
Net Export (Import)	(17,042)		(2,625)	
C. India				
Export	260	0.06	0	
Import	(4,217)	(0.82)	2	(0)
Net Export (Import)	(3,957)		(2)	
D. Indonesia				
Export	8,570	2.15	0	
Import	(2,927)	(0.57)	(722)	(0.36)
Net Export (Import)	5,643		(722)	
E. Malaysia				
Export	3,092	0.78	0	(0.22)
Import	(7,749)	(1.50)	(422)	(0.22)
Net Export (Import)	(4,657)		(422)	
F. Papua-New Guinea				
Export	84	0.02	0	
Import	(0)	(0)	(0)	(0)
Net Export (Import	84		0	
G. Philippines				
Export	1,329	0.33	0	
Import	(2,835)	(0.55)	(12,030)	(6.10)
Net Export (Import)	(1,506)		(12,030)	
H. Thailand				
Export	1,899	0.48	0	
Import	(30,599)	(5.94)	(174)	(0.09)
Net Export (Import)	(28,700)		(174)	

Note: 1) All import data are enclosed with parentheses().

2) Taiwan Province, Korea, Hongkong and Singapore supply almost 80 per cent of Japan's rattan furniture imports.

Source: Furnitures Export and Import of Japan, 1977-1981, International Development Association of the Furniture Industry of Japan, Tokyo.

Table 11 Japan's annual export/import of wooden furniture

(US $ 1,000)

	1977		1978		1979		1980		1981	
	Value	% Japan Total	Value	% Japan Total	Value	% Japan Total	Value	% Japan Total	Value	% Japan Total
I. Japan total										
Export	35 763	100	40 329	100	44 505	100	70 950	100	92 269	100
Import	(94 226)	(100)	(110 065)	(100)	(182 738)	(100)	(184 884)	(100)	(166 566)	(100)
Net Export (Import)	(58 463)		(69 736)		(138 233)		(113 934)		(74 297)	
II. Asia										
Export	20 402	57	17 508	43	22 068	50	37 391	53	42 639	46
Import	(67 565)	(72)	(80 540)	(73)	(136 472)	(75)	(137 769)	(74)	(122 515)	(73)
Net Export (Import)	(47 164)		(63 032)		(114 404)		(100 378)		(79 876)	
III. Europe										
Export	2 254	6	7 105	18	9 548	21	14 801	21	19 841	22
Import	(23 406)	(25)	(25 627)	(23)	(38 945)	(21)	(40 551)	(22)	(35 461)	(21)
Net Export (Import)	(21 152)		(18 522)		(29 397)		(25 750)		(15 620)	
IV. North America										
Export	9 918	28	13 259	33	10 172	23	11 360	16	20 379	22
Import	(2 388)	(3)	(3 325)	(3)	(6 492)	(4)	(5 846)	(3)	(8 006)	(5)
Net Export (Import)	7 530		9 934		3 680		5 514		12 373	
V. South America										
Export	171	0.5	195	0.5	408	9	2 185	3	2 618	3
Import	(761)	(0.8)	(532)	(0.5)	(724)	(0.4)	(523)	(0.3)	(382)	(0.2)
Net Export (Import)	(590)		(337)		(316)		1 662		2 236	
VI. Africa										
Export	924	3	773	2	953	2	2 617	4	3 954	4
Import	(5)	(NEG)	(7)	(NEG)	(22)	(NEG)	(25)	(NEG)	(52)	(100)
Net Export (Import)	919		766		931		2 592		3 902	
VII. Oceania										
Export	2 095	6	1 490	4	1 355	3	2 595	4	2 838	3
Import	(100)	(0.1)	(35)	(0.03)	(83)	(0.04)	(171)	(0.1)	(175)	(0.1)
Net Export (Import)	1 995		1 455		1 272		2 424		2 663	

Source: Furniture Export and Import of Japan, 1977-1981, International Development Association of the Furniture Industry of Japan, Tokyo.

Note: All import data are enclosed in parentheses ( ).

II. POTENTIALS AND REQUIREMENTS FOR INCREASED PROCESSING OF WOOD AND WOOD INDUSTRY PRODUCTS

4. Economic aspects of selected products

4.1 Labour costs

The wood products industry average wages (1976-1980) in all Asian developing countries reporting to the ILO, Geneva, (51), have been increasing since 1976. India reported an average increase of 3.6 per cent per year for the primary wood processing sector and 0.79 per cent per year for the wooden furniture and fixtures manufacturing industry (using 1976 as base year), the lowest among the countries under study. The Wage Commission of the Philippines (7) reported an average wage of P11.52 per day for the wood and wood products industry, while the Institute of Developing Economies, Tokyo, in a study prepared by SGV, Philippines, reported an industry average rate of P25.23 per day in 1980. These figures indicate an average annual increase of 23.5 per cent, the highest among the developing countries under study. Burma, as indicated by the ILO Annual Report (7) showed an average annual increase of 11 per cent for the industry wage rates, which is about the median for the developing countries under study.

In comparison, among the intermediate wood-processor countries of Asia, Japan showed the lowest annual average increase of wage rates for the industry during the period 1976-1980, at 6.8 per cent per year, while the Republic of Korea reported the highest indicated average annual industry wage increase of 34.8 per cent per year for the primary sector and 63.3 per cent per year for the wooden furniture and fixtures sector of the industry (7).

However, the annual rate of increase in the industry's average wages appears to have been tapering off since 1979 for both the developing countries under study and the intermediate wood processor countries of Asia.

The daily wage rate levels (based on 8-hour working day and 25 working days per month) as of 1980 for the above cited countries are as follows:

Country	Wood and wood products, including furniture ISIC - 33	Wood and Cork products, except furniture ISIC - 331	Furniture and fixtures, except primarily of metal ISIC - 332
India	..	Rp. 10.26 (US$ 1.15)	RP. 12.28 (US$ 1.38)
Burma	..	Kyat 6.32 (US$ 0.82)	Kyat 11.12 (US$ 1.43)
Philippines	P 25.23 (US$ 2.65)	.. ..	.. ..
Rep. of Korea	..	Won 5689 (US$ 7.68)	Won 5757 (US$ 7.77)
Japan	..	Y 7616 (US$ 32.82	Y 7732 (US$ 33.33)

Note: 1) Current exchange rates were used in converting local currencies to US dollars equivalent.

2) .. Data not available.

Wage rates in the countries under study are indicated to continue increasing corresponding to the rise in the cost of living in each country.

The wood processing industry wage levels in the developing countries under study are about 1/15 to 1/30 of the wage levels in Japan and 1/11 to 1/18 of the wage levels in the Republic of Korea. Corresponding levels of productivity have to be considered for a more accurate appraisal of the advantage of lower labour costs in the developing countries under study. In 1980, Japan reported an average Y4.19 x 10^6 (US $18.06) per year of value added by each worker in the wood processing industry (21). In comparison, the Philippines, one of the more advanced wood processing countries among the developing countries under study, reported an average P11.918 (US $1,255) per year of value added by each worker in the wood processing industry, with an average annual increase in value added per employee of only 1.2 per cent for the period 1973 to 1974. Productivity in the other developing countries with less developed wood processing industries than that of the Philippines would not likely be higher.

4.2 Raw material costs

In the decade before 1980, South Sea logs were sold at generally lower wholesale prices than competitor species (Japanese Cedar, U.S.A. Hemlock and North Sea Fir) in the Japanese market (see Table 13). There was, however, a general up-trend in prices of all the species with South Sea logs selling in 1979 at prices 2.65 times their price in 1970, against 1.89 times for Japanese Cedar, 2.05 times for U.S.A. Hemlock and 1.99 times for North Sea Pine during the same period. However, from 1980 until 1982 prices of South Sea logs were generally higher than the competitor species such that in 1982 logs sold at US$11.00 more than Japanese Cedar, the next-highest-priced competitor.

The Philippines, according to the major Japanese lumber trading firms, enjoy better log prices in Japan than the other log exporting countries of Southeast Asia. Shown below is a comparison between average wholesale prices in the Japanese market and Philippine FOB prices:

Product	FOB, Philippines US$/$m^3$	Wholesale Price, Japan US$/$m^3$
Logs	120.53	152.37
Lumber, Red	363.89	Not available
Lumber, White	196.89	Not available
Plywood	230.50	309.16

The 1982 average wholesale price of North Sea Firs in the Japanese market (Table 12) is about US$8.00 lower than the FOB price of Philippine lauan logs. It is therefore understandable that the Japanese users of Philippine logs are seriously considering the use of North Sea Fir (Mainly Russian pine) as a substitute for logs.

4.3 Transport costs

The major component of transport costs of wood products from the supplier ports to Japan, Republic of Korea and the province of Taiwan is shipping

Table 12 Annual average wholesale and retail prices of logs, lumber and plywood, Japan, 1970-1982
(in dollars per m^3 where ¥232 = $1)

Year	Wholesale prices - LOGS				Wholesale prices - LUMBER/PLYWOOD				Retail prices - LUMBER/PLYWOOD			
	Japanese Cedar ø: 14-22 cm L: 3.65 m	U.S.A. Hemlock ø: 30 cm L: 6 m	North Sea Fir ø: 20-28 cm L: 3.8 m	Lauan ø: 60 cm L: 6 m	Japanese Cedar 105x105x 3600 mm	U.S.A. Hemlock 105x105x 3000 mm	North Sea Fir (30-36)x45x (3650-4000)mm	Lauan Plywood 12x900x 1800 mm	Japanese Cedar 105x105x 3000 mm	U.S.A. Hemlock 105x105x 3000 mm	North Sea Fir (30-36)x45x (3650-4000)mm	Lauan Plywood 12x900x 1800 mm
1970	81.90	63.79	65.95	57.76	155.60	-	-	219.65	182.31	143.31	144.36	-
1971	76.29	65.09	64.66	57.33	146.12	-	-	194.96	182.31	130.31	144.36	243.83
1972	85.34	71.55	68.96	49.14	189.22	-	-	192.90	208.62	156.31	158.45	244.86
1973	124.57	112.93	105.60	76.72	274.57	200.00	196.98	303.50	325.62	247.62	250.00	354.94
1974	143.53	112.50	103.88	98.71	270.69	176.72	171.98	235.08	312.62	234.62	242.45	288.06
1975	138.79	106.46	98.71	75.86	268.10	175.43	163.36	199.59	312.62	221.62	227.11	221.71
1976	139.66	113.36	103.45	101.72	281.03	199.14	190.95	257.20	325.62	247.62	250.00	288.07
1977	136.21	112.50	110.78	103.88	267.24	197.41	202.59	243.83	325.62	247.62	257.04	288.07
1978	131.47	102.15	96.12	82.76	252.59	181.46	189.65	208.33	312.62	234.62	250.00	247.94
1979	155.17	131.03	131.46	153.02	311.21	241.81	254.74	332.30	364.93	286.62	318.66	369.86
1980	172.84	150.86	154.74	183.62	318.10	253.88	270.69	365.74	390.93	312.62	357.39	416.67
1981	164.12	128.02	115.09	137.93	255.17	213.36	205.03	283.95	338.93	260.62	288.73	332.30
1982	140.95	132.76	112.72	152.37	257.76	230.82	217.89	309.16	325.62	273.62	292.25	351.34

Source: Japan Export Trade Office (JETRO), Tokyo, Japan.

(sea freight) costs. Since the price of oil products started its great increases from the early 1970s, freight costs correspondingly increased. However, freight rates have not increased since the last increase in March 1981. Latest reports indicate decreases (except for logs from Papua-New Guinea) in sea freights for 1983, as follows:

Product	From/To	(US$/m^3) F/T a/ Feb. 1982	F/T b/ March 1983
Logs	Malaysia to Japan	27.56	14-15
	Indonesia to Japan	26.00	21-22
	Papua-New Guinea to Japan	21.50	26.00
Plywood and sawn timber	Indonesia to Japan	38.50	33.00
Other wood products	Indonesia to Japan	45.00	40.00

Data Sources: a/ Data from (44) of Bibliography.
b/ Data supplied by Sumitomo Forestry Co. Ltd, Tokyo, Japan

The sea freight rates given above are about 30 per cent to 40 per cent below peak traffic freight rates expected in the later half of the year. However, in view of the recent cut in oil prices, the peak rates for sea freight may not reach forecast levels.

4.4 Capital costs

Capital costs for wood processing plants vary according to location of the plant, the state of technological development of the developing country and country policies on the wood processing industry. Landed costs of machinery and equipment generally vary directly with the distance of the buyer country from the supplier country, and with the tariff levels imposed by the buyer country. The cost of initial machinery and equipment spare parts inventory also vary directly with the technological development of the country, and the lead time required for replenishment of the spare parts inventory. Thus, the common practice is to provide at least one year supply of spare parts together with the shipment of machinery and equipment. In some developing countries, e.g., the Philippines and Thailand, where the level of technological development is appreciably higher than in the other countries, a maximum 6 months supply of spare parts is sufficient.

The cost of civil works, buildings and structures is also a function of the technological and economic development of the country and the remoteness of the plant site from industry and commercial centers within the country. Thus, in Indonesia it would cost more to erect the same woodworks plant in East Kalimantan than in Java or Sumatra; similarly, in Malaysia, it would cost more to erect the same woodworks plant in Sabah or Sarawak than in Peninsular Malaysia.

In addition to the above enumerated local factors affecting the cost of erecting woodworks plants in developing countries there are factors which are beyond the control of the project proponent country, e.g. the FOB costs of imported machinery and equipment, construction materials and technical expertise, all of which have been increasing during the past 10 year period.

The following case study illustrates the significant increase in costs for wood processing plants in Asian developing countries. The cost figures below refer to a woodworks plant erected in 1971-1972 in Mindanao, Philippines, with a rated sawn-timber input of about 5,800 m^3 per month to produce mouldings, louvre doors, window frames, drawer sides and other builder's woodworks.

Project cost items	Actual costs in 1971-1972	(US $ 1000) Costs if plant were erected in 1980-1981	Percentage increase in costs
Imported machinery and equipment, including 6-months supply of spare parts	987	2,567	160.1
Installation costs (labour and materials)	62	108	74.2
Civil works, including buildings and structures	2,019	2,870	42.1
Production fixtures	48	84	75.0
Initial operating capital, 3 months	167	250	49.7
Total project cost	3,283	5,879	79.1

Note: In 1971-1972, US$1.00 = PhP6.00
In 1980-1981, US$1.00 = PhP8.75

The above figures show that the huge increase in machinery and equipment cost is the principal contributor to the increase of total project costs from 1971-1972 to 1980-1981. Furthermore, the per cent increase in costs of civil works (including buildings and structures) is significantly below the per cent increase in total project costs, as all construction materials and labour are locally supplied. The per cent increase in costs of production fixtures (locally fabricated) and machinery and equipment installation, in spite of locally-supplied labour, were higher than the per cent increase in civil works due to the high increase in costs of imported materials used in the two project activities.

Higher cost increases may be expected if the same woodworks plant were erected in less developed countries (e.g. Papua-New Guinea) and countries farther from the equipment supplying country, Japan, (e.g. Indonesia, Malaysia and Thailand).

Future trends in capital costs will depend on world-wide economic trends, and the level of development attained by the developing country.

5. Industrial strategy, policy and planning

Aird and Calow (2) have shown that the following factors influenced the growth in forest products trade and investment during the last decade:

(i) The oil price adjustment since 1973 affected world economic conditions such that there has been slower growth in principal end-use markets for forest-products;

(ii) Direct inflationary impact of higher oil prices on wood, energy and capital costs and their indirect effect on labour costs effected sharp increases in manufacturing costs of wood products;

(iii) The capital costs of minimum economic plant size, particularly in the capital-intensive pulp and paper industry, have increased to the point where returns on investments are small and slow;

(iv) The availability of other sources for low-cost timber has diminished.

These same factors, together with the current resources and industrial capability of the developing countries under study, will be considered in the following discussion of the countries' strategies, policies and plans for their wood industries.

5.1 Current strategies, policies and planning

Except for Papua-New Guinea, the timber surplus countries of Insular Southeast Asia and the Pacific have currently expressed their desire to process all their timber produce and export the products in one form of manufacture of another. This intention is being implemented through restrictions or ban of log exports, incentives for investments in the wood processing industries and allocation of funds for systems of national infrastructures that will help accelerate the growth of the wood processing industry, with each developing country employing other economic moves to suit its needs and capabilities for industrial growth.

Peninsular Malaysia, Sabah and the Philippines have opted for severe restrictions on log exports eventually leading to a total ban of log exports. Their main objective is to maximize the utilization of existing primary processing facilities and encourage the growth of the secondary processing sector in order to meet the increasing demands of the domestic market.

Indonesia tightened its log export quota regulations and may have to impose a total ban on log exports much sooner than previously intended in order to assure adequate timber supply to its rapidly growing plywood manufacturing industry. On the other hand, Indonesia has not put commensurate stress on the development of its production capacities for other wood-based panels and the secondary wood processing sector. Furthermore, rationalization of its sawmilling industry, which is a pre-requisite for the growth of its secondary wood processing sector, is far from being attained yet.

Sarawak and Papua-New Guinea have remained liberal in their log export policies. According to a recent World Bank study Sarawak seems to have

"more room to collect higher resource rents on log exports than it does now" and it "may be foregoing both the resource rents on logs exported and the benefits of local processing" (71). In the case of Papua-New Guinea, the heterogenous nature of its timber resources makes its timber products less attractive than those of the Philippines, Malaysia and Indonesia (excluding West Irian). Its main concern at present is to be able to market all the timber species cut from its forests.

On the other hand, Japan, the main intermediate wood-processor country of Asia and the Pacific, is almost totally dependent upon timber imports for the supply of its plywood milling industry. The decision of the timber surplus countries of Asia to restrict log exports as a means of increasing resource rents from log sales and to benefit from value added by domestic processing, will definitely cause a restructuring or re-orientation of Japan's wood processing industry, particularly its plywood milling industry.

Similar impacts will be felt by the wood industries of the Republic of Korea and the Province of Taiwan, the other two major intermediate wood processor countries in Asia and the Pacific.

5.2 Re-orientation of strategies, policies and planned targets

The developing countries of Asia offer significant advantages for the location of wood processing industries, among which are:

(i) Their huge population of almost two billion people (China, India, Indonesia, the Philippines and Thailand alone have a total of about 1.6 billion people) provide a huge, readily available domestic market for wood products;

(ii) The lower labour costs in these countries offer definite manufacturing advantages to the labour intensive nature of mechanical wood processing;

(iii) Processing of timber in source countries (i.e. Indonesia, Malaysia, Papua-New Guinea and the Philippines) offers significant potential

for reduced costs of wood products in terms of lower transport costs for processed wood products (which would have been higher if logs were transported from these countries to the Intermediate Wood Processor countries of Asia or Europe).

The preceding sections of this document have described the wood resources, current wood processing facilities and capacities, investment policies, etc. of the developing countries under study. These characteristics and capabilities are summarized in Table 13.

Table 13 indicates that development and expansion of the primary sector of the wood processing industry (sawmilling, veneer and plywood manufacturing, other wood-based panels production) will find very suitable conditions in Burma, Indonesia, Malaysia, the Philippines and Papua-New Guinea, from the point of view of timber supply. However, local conditions will have to be improved with respect to availability of other production materials and supplies (e.g. synthetic resins, hardware and fittings, fasteners, etc.) which will be needed by the expanded processing operations in the primary and secondary sectors of the industry. All these countries have lower cost labour which could be tapped for the unskilled labour requirements of the expanded industry. However, except in the Philippines, all these countries need to provide training facilities to supply the higher skilled, supervisory and managerial personnel requirements of the expanded industry. The same situation applies to the availability of technical support staff such as industrial engineers, woodworks plant engineers and designers.

Except for Papua-New Guinea and the Malaysian states of Sabah and Sarawak, the population sizes of the developing countries under study indicate good potential for development of the domestic market as a principal goal of the expansion and development of their wood processing industries. In this respect, China, India and Indonesia have the biggest domestic market potential. However, it is indicated that existing transport networks and infrastructure vital to the development of domestic trade, need improvement in most of the developing countries under study. Furthermore, all of those countries need to improve their sea transport infrastructure to support any expansion of export trade in wood products. It appears that Japan is the most

Table 13 Status of capability for development and expansion of the current wood processing industries in selected developing countries of Asia as of 1982

Elements for development of the wood processing industry	Burma	China excluding Taiwan	India	Indonesia	Peninsular Malaysia	Sabah	Sarawak	Papua New Guinea	Philippines	Thailand
I. Primary raw material resources										
A. Logs	++	(-)	(-)	++	+	++	++	+	+	+
B. Sawn wood	+	(-)	(-)	+	++	++	++	(-)	++	(-)
II. Availability of other production materials										
A. Adhesives	(=)	+	+	(-)	(-)	(=)	(=)	(=)	++	(-)
B. Paints/Coating materials	(=)	++	++	(-)	+	(=)	(=)	(=)	++	+
C. Upholstery materials	(=)	++	+	(=)	(=)	(=)	(=)	(=)	(-)	(-)
D. Hardware, fittings, fasteners, etc.	(=)	+	+	(=)	(=)	(=)	(=)	(=)	(-)	(=)
III. Availability of production supplies										
A. Abrasives	(=)	+	+	(=)	(-)	(=)	(=)	(=)	(-)	(-)
B. Cutting tools	(=)	(-)	(-)	(=)	(=)	(=)	(=)	(=)	(-)	(-)
C. Packaging/crating supplies	(-)	+	+	(-)	(-)	(=)	(=)	(=)	(-)	(-)
IV. Availability of labour										
A. Unskilled and semi-skilled	++	++	++	++	++	++	++	(-)	++	++
B. Skilled	(-)	++	+	(-)	+	(-)	(-)	(=)	+	+
C. Highly skilled	(-)	+	(-)	(=)	(-)	(=)	(=)	(=)	+	+
D. Middle management	(-)	+	+	(-)	(-)	(=)	(=)	(=)	+	(-)?
E. Top management	(-)	+	+	(=)	(-)	(=)	(=)	(=)	+	(-)?
F. Technical support:										
1. Industrial engineers	(=)	+	+	(-)	(-)	(=)	(=)	(=)	+	(-)
2. Designers	(=)	(-)	(-)	(=)	(-)	(=)	(=)	(=)	(-)	(-)
3. Woodworks plant engineers	(=)	+	+	(-)	(-)	(=)	(=)	(=)	(-)	(-)?
V. Marketing and distribution										
A. Domestic market potential	++	++	++	++	++	(-)	(-)	(-)	++	++
B. Accessibility to export market:										
1. Japan	(-)	+	(-)	(-)	+	+	+	(-)	+	(-)
2. Europe	+	(-)	+	(-)	(-)	(-)	(-)	(-)	(-)	+
3. Middle East	+	(-)	+	(-)	(-)	(-)	(-)	(-)	(-)	+
4. America	(-)	(-)	(-)	(-)	(-)	(-)	(-)	(-)	(-)	(-)
C. Transport networks and infrastructure:										
1. For domestic trade	(-)	+	+	(-)	(-)	(-)	(-)	( )	+	+?
2. For export trade	(-)	(-)	(-)	(-)	(-)	(-)	(-)	(-)	(-)	(-)
VI. Research and development facilities and activities										
A. Basic research	(=)	++	++	+	+	(-)	(=)	(-)	+	+
B. Industry oriented research	(=)	+	+	(-)	(-)	(=)	(=)	( )	(-)	(-)
VII. Capital for industry development										
A. Incentives for domestic investment:										
1. Primary sector	+?	+	+	+	(-)	+	+	+	(-)	(-)
2. Secondary sector	+?	+	(-)	(-)	+	+?	+?	(-)	+	+
B. Incentives for foreign investors:										
1. Primary sector	(-)?	(-)	(-)	+?	(-)	(-)?	(-)?	+	(-)	(-)
2. Secondary sector	+?	(-)	(-)	(-)	(-)	(-)?	(-)?	(-)	+	(-)

Legend: + : Favourable current conditions for accelerated development of wood processing industry, need to be maintained.

++ : Favourable current conditions likely to remain so beyond year 2000.

(-) : Current conditions need to be improved to meet needs of accelerated development of wood processing industry.

(=) : Unfavourable current conditions, likely to remain so till year 2000.

? : Available data not too definite about current status.

accessible market to the developing countries under study, while the Middle East is most accessible to India.

Development and expansion of the wood processing industries also need the impetus that can be supplied by local research and development activities. Sabah and Sarawak will have to rely on the basic R and D activities in Peninsular Malaysia, as they do not have such facilities to support the growth and development of their wood processing industries. Papua-New Guinea, in view of the heterogeneous nature of its timber resources, needs more species-oriented development of its basic R and D activities. Except for India and China, all the developing countries under study are badly in need of more industry-oriented research and development activities.

Incentives for domestic investors in the primary sector of the industry in Peninsular Malaysia, the Philippines and Thailand are rated unfavourable for further expansion of their primary wood processing industries for their governments have adopted policies discouraging new capacities in the industry sector. Except for the Centrally Planned Economies, incentives for domestic investors in the secondary sector are favourable for development of the industry.

Indonesia and Papua-New Guinea appear to have favourable incentives for foreign investors in the primary sector of the industry, although the latest trend in Indonesia is for majority participation of local investors in the primary industry. Burma and the Philippines have favourable incentives for foreign investment (except equity participation) in the secondary sector of the industry.

The choice of directions in the development and expansion of the wood processing industry in the developing countries under study is a matter of national policy, and is often highly influenced by economic factors external to the industry. In general, however, strengthening of the domestic market base, whether for the primary or secondary wood products, is a good insurance for the continued success of development programmes for the industry.

The ultimate objective, from the point of view of development economists, would be to maximize the income (net) generated from forest exploitation.

Ideally, this may be realized if the country's programmes for the development of the wood processing industry would call for the use of higher grade logs for veneer and plywood and manufacturing and lower grade logs for sawmilling and the residues from both logging and industrial operations are used for the production of other wood-based panels such as blockboard, particle board, fibreboard, etc.

Where local conditions favour the development of the wood-based panels manufacturing sector, guidelines on the type of wood-based panels to be produced in developing countries have been made available by UNIDO (73). These guidelines indicate that Indonesia may have chosen wisely to develop and expand its plywood manufacturing industry. However, considering the huge volume of logging and industrial residues that will be generated by the expanded industry, it may also be judicious for Indonesia to consider a parallel development of other wood-based panels production facilities which will convert these residues into marketable products.

5.3 Industrial indicators for the wood processing industries of selected Asian developing countries

The annual growth rates of real manufacturing value added, 1970-1980, are given in Table 14 for Burma, India, Indonesia, Malaysia, the Philippines and Thailand. Among the countries shown there, high annual growth rates for the primary wood processing industry were indicated for Indonesia during the latter half of the decade; while both the Philippines and Indonesia showed the biggest annual growth rates of the wooden furniture manufacturing industry in the first half of the decade.

Table 15 shows the structural changes of value added in manufacturing, 1970-1979, for the same countries (except Burma). Malaysia, as a whole, registered very significant participation (more than 30 per cent) of the primary wood processing branch in the country's total industries' MVA, principally due to the contributions from Sabah and Sarawak. The primary wood processing branch share was less than 8 per cent participation for all other countries studied. The contribution of the furniture manufacturing branch

Table 14 Trend growth rates in the Index of Industrial Production 1970 - 1980, for selected Asian developing countries Wood products (ISIC-331) and furniture, except metal (ISIC-332)

Year	Burma	India	Indonesia		Malaysia	Philippines		Thailand
	331 and 332	331 and 332	331	332	331 and 332	331	332	331 and 332
1970 - 1971	- 1.9	9.1	11.0	6.7	0.0	-22.8	-8.6	2.7
1971 - 1972	6.5	- 9.7	0.0	12.5	21.0	33.0	100.0	54.7
1972 - 1973	- 9.1	-27.7	-16.0	25.9	15.3	15.4	34.4	1.7
1973 - 1974	-23.3	108.5	27.9	41.2	- 6.2	-25.9	27.9	-19.5
1974 - 1975	-13.0	2.0	14.9	4.2	- 5.7	0.0	- 9.1	5.8
1975 - 1976	-18.0	9.0	18.0	13.0	37.0	6.0	- 1.0	1.0
1976 - 1977	24.4	13.8	66.9	n.a.	6.6	13.2	-10.1	4.0
1977 - 1978	20.6	- 5.6	10.7	n.a.	- 7.5	- 5.8	7.9	- 8.6
1978 - 1979	12.2	5.1	0.9	n.a.	0.0	10.6	8.3	15.6
1979 - 1980	0.7	- 6.5	78.2	n.a.	0.0	2.4	- 2.9	n.a.
Trend 1970-1980 except as noted	- 2.8	1.0	17.6	18.7[a/]	5.9	1.6	10.7	2.8[b/]

Legend: a/ 1970-1976

b/ 1970-1979

n.a. Data not available

Note: Data for China and Papua-New Guinea are not available as of this writing.

Source: UNIDO Data Base

Table 15 Structural changes of value added in manufacturing, 1970-1979 (sectoral shares, percentages, on basis of value in national currency at current prices) for selected Asian developing countries

Industry Branch and Year	India	Indonesia	Peninsular Malaysia	Sabah	Sarawak	Philippines	Thailand
A. Wood products (ISIC-331)							
1970	0.6	0.9	10.0	28.0	44.4	4.0	4.6
1971	0.6	1.2	9.6	25.0	56.4	4.2	n.a.
1972	n.a.	3.1	11.7	33.0	58.6	7.6	n.a.
1973	0.6	2.6	13.2	33.0	66.5	4.7	n.a.
1974	0.6	n.a.	10.2	40.6	49.4	3.1	n.a.
1975	0.6	3.4	8.1	41.1	52.4	3.8	n.a.
1976	0.6	3.5	9.4	43.4	60.6	4.1	n.a.
1977	0.6	3.3	n.a.	35.0	57.0	4.0	n.a.
1978	0.6	4.0	9.7	35.7	56.7	n.a.	n.a.
1979	n.a.	4.4	n.a.	n.a.	n.a.	n.a.	n.a.
B. Furniture, except metal (ISIC-332)							
1970	0.1	0.2	0.6	6.9	2.0	0.4	0.6
1971	0.1	0.3	0.6	5.8	1.8	0.4	n.a.
1972	n.a.	0.2	0.5	2.2	1.5	0.6	n.a.
1973	0.1	0.3	0.6	6.5	2.2	0.5	n.a.
1974	0.1	n.a.	0.7	4.6	1.6	0.5	n.a.
1975	0.1	0.4	0.8	3.3	1.7	0.5	n.a.
1976	0.1	0.3	0.6	3.3	1.3	0.9	n.a.
1977	0.1	0.2	n.a.	2.9	1.6	1.1	n.a.
1978	0.1	0.2	0.7	3.2	1.3	n.a.	n.a.
1979	n.a.	0.2	n.a.	n.a.	n.a.	n.a.	n.a.

Legend: n.a. - Data not available.

Note: Data for Burma, China and Papua-New Guinea are not available as of writing.

Source: UNIDO data base

in all the countries studied was much smaller than that of the primary wood processing industry, mostly less than 4 per cent during the latter half of the decade.

The corresponding gross output, value added and gross fixed capital contributions of the primary and wooden furniture manufacturing branches of the industry for eight Asian developing countries are given in Table 16.

5.4 Long term strategies for the development of the wood processing industries in Asian developing countries

The resources and capabilities of selected Asian developing countries with potential for accelerated development of the wood processing industry discussed in previous paragraphs indicate the need for different long term development strategies.

Considering that the tropical timber supply situation in Asia will continue to tighten through the first few decades of the next century, the following general strategies are indicated:

(i) The timber deficit countries with large domestic market base, China (except the Province of Taiwan), India and Thailand must intensify their forest rehabilitation and enrichment activities and timber specie replacement programmes to enable them to meet their expected timber supply deficits. Both their primary and secondary wood processing industry sectors should be geared mainly to meet the domestic demands for wood products. In the case of Thailand, which expects smaller timber deficits than China and India, limited exports of secondary wood products could be possible if substantial progress could be attained in its efforts to develop substitutes (rubber wood and coconut timber) for the traditionally accepted timber species. No major expansion of its primary wood processing sector but accelerated development of the secondary wood processing industry is recommended.

(ii) Indonesia and the Philippines have large timber resources and domestic markets. Both countries also have well developed export-

TABLE 16 GROSS OUTPUT, VALUE ADDED AND GROSS FIXED CAPITAL FORMATION: SELECTED ASIAN DEVELOPING COUNTRIES

	China (million Yuan)	Burma (million Kyats)	India (million Rupees)	Indonesia (million Rupiahs)	Peninsular Malaysia (million Ringgits)	Sabah (thousand Ringgits)	Sarawak (million Ringitts	Papua-New Guinea (thousand Kinas)	Philippines (million Pesos)	Thailand (million Bahts)
I. WOOD PRODUCTS (ISIC-331)										
A.Gross output	Unknown	Producer values	Factor values	Producer values	Factor values	Factor values	Unknown	Factor values	Producer values	Producer values
1970	n.a.	71 a/	780	2,670	332	10,114	92.02	15,701	659	1,168
1977	n.a.	84 b/	1,932	71,300	1,120 b/	60,225	192.60	35,850	1,742	n.a.
1979	2,243 d/	n.a.	2,152 c/	182,100	1,471 c/	72,354 c/	221.55 c/	39,542	n.a.	n.a.
B.Value added	Unknown		Factor values	Factor values	Factor values	Factor values	Unknown	Factor values	Producer values	Producer values
1970	n.a.	n.a.	183	920	118	4,254	38.41	8,203	254	320
1977	n.a.	n.a.	455	25,620	347 b/	24,959	77.55	16,205	505	n.a.
1979	n.a.	n.a.	493 c/	57,400	514 c/	29,376 c/	93.96 c/	21,425	n.a.	n.a.
C.Gross fixed capital formation										
1970	n.a.	n.a.	n.a.	100	39-57	1,601	3,760	n.a.	67.2	n.a.
1977	7	n.a.	94	21,370	74 b/	n.a.	n.a.	n.a.	75.6	n.a.
1979	13	n.a.	n.a.	8,090	84 c/	n.a.	n.a.	n.a.	n.a.	n.a.
II. FURNITURE EXCEPT METAL (ISIC-332)										
A.Gross output	Unknown	Producer values	Factor values	Producer values	Factor values	Factor values	Unknown	Factor values	Producer values	Producer values
1970	n.a.	56 a/	146	640	25	2,183	4.02	326	56	114
1977	8,785	59 b/	184	4,200	60 b/	4,795	6.92	424	410	n.a.
1979	10,011	n.a.	196 c/	5,800	95 c/	6,097 c/	6.47 c/	9,224	n.a.	n.a.
B.Value added			Factor values	Factor values	Factor values	Factor values	Unknown	Factor values	Producer values	Producer values
1970	n.a.	n.a.	42	230	7	1,044	1.73	169	27	44
1977	n.a.	n.a.	48	1,920	23 b/	2,049	2.22	198	133	n.a.
1979	n.a.	n.a.	46 c/	2,500	37 c/	2,605 c/	2.08 c/	4,144	n.a.	n.a.
C.Gross fixed capital formation										
1970	n.a.	n.a.	n.a.	0	0.59	83	125	n.a.	0.7	n.a.
1977	n.a.	n.a.	10	750	4 b/	926 e/	n.a.	n.a.	21.4	n.a.
1979	n.a.	n.a.	8 c/	920	10 c/	n.a.	n.a.	n.a.	n.a.	n.a.

Legend: n.a. - data not available
a/ Data for 1972 used
b/ Data for 1976 used
c/ Data for 1978 used
d/ Data for 1980 used
e/ Data for 1975 used

Source: UNIDO Data Base

oriented plywood manufacturing industries, but less developed secondary wood processing industries. The domestic market for primary and secondary wood products in both countries has yet to be fully satisfied.

The Philippine sources of lauan species timber have become more remote and scarcer. Efforts therefore should be exerted to conserve these species through the use of acceptable substitutes, at least for corestock and back veneers of plywood panels. This further indicates the need for intensification of forest rehabilitation and timber plantation activities and the use of commercially less accepted species. The country's on-going massive housing programmes indicate the urgent need to accelerate development of the secondary wood processing industry. Again, the use of commercially less accepted species should augment the supply of traditional species to meet the sawnwood needs of both the domestic and export-oriented secondary wood processing industry.

The timber surplus status of Indonesia is not expected to change significantly by the end of this century. However, in view of the current tremendous acceleration of the growth of its plywood industry, the country will be relying more and more in the future on the heterogeneous forest stands of West Irian to supply the timber needs of its wood processing industry, in addition to the teak forests of Java and Sumatra. Thus, a shift towards more accelerated development of export-oriented secondary wood processing industry is indicated during the first two decades of the next century, provided the supply of skilled labour and technicians could support such a shift.

(iii) The case of timber-rich Malaysia has to be treated separately for the situation is complicated by the autonomous position of the states of Sabah and Sarawak with regard to development of their wood and wood products industry.

The timber supply and processing industry situation in Peninsular (West) Malaysia is very similar to the current situation in the

Philippines. Thus, any strategy for the country's wood and wood products industry should be similar to that recommended for the Philippines.

Sabah and Sarawak, however, are timber rich states with small domestic market bases. Their forests are more homogeneous with respect to timber species from West Malaysia, and are very similar to the timber stands of West Kalimantan, Indonesia. Current development of the primary industry sector is greatly impeded by the lack of skilled labour and technicians, in addition to lack of supervisory and managerial personnel. Accelerated development of the primary wood processing industry, therefore, may be pursued only through the importation of skilled labour and technicians, coupled with the establishment of intensive training programmes for all levels of the industry requirements.

(iv) The wood processing industries of Burma and Papua-New Guinea are the least developed among the countries studied. The timber supply of Burma is predominantly teak which is more suitable for furniture and woodworks, while that of Papua-New Guinea is highly heterogeneous. Burma has a large domestic market potential while that of Papua-New Guinea is very small.

More emphasis on the export-oriented development of the secondary wood processing industries of both countries is indicated, supported by a limited development of the primary sector (principally plywood manufacturing) to meet the domestic demands.

Intensive research and development activities to determine further uses of the various timber species in Papua-New Guinea is recommended, including the possibility of manufacturing fibreboard (in small scale plants as in China), for export to the nearby Pacific islands.

Both Burma and Papua-New Guinea have to rely on imported skills until they can train enough manpower at all the levels of work and supervision required by their development programmes.

6. Implications for investment, production and employment

The foreign discussions on the possible directions of growth in the wood processing industries of the developing countries under study indicate varied shifts in investments. More investment in the secondary processing sector and wood-based panel manufacturing other than plywood milling should be expected in the Philippines, Malaysia and Thailand. The same should be true for India and China, although on a much larger scale. Burma and Papua-New Guinea will still require significant investments in the primary sector of their wood processing industries, and moderately increasing investments in secondary wood processing. In view of Indonesia's great emphasis on the development of its plywood milling industry, with application for 88 more mills (68) being considered, huge investment in the industry is to be expected in the near future. Correspondingly, the magnitude of such development of Indonesia's plywood milling industry will affect increased investments in other industries that support the plywood milling industry, particularly the synthetic resin manufacturing industry.

Increased production capacities in the industry will generate more job opportunities in the developing countries under study. The wood industry development programmes of Indonesia and Papua-New Guinea is estimated to require at least 1,000 new machine operators, production supervisors and technical support staff every year (44). This demand for adequately trained workers for the wood processing industry will certainly require more investments in labour training facilities in these two countries. Similar situations, although on lesser scales and principally for the secondary sector, are expected to arise under the development programmes for the wood processing industries of the other countries under study.

7. Humanpower and training requirements

7.1 Skilled labour

Almost all of the developing countries under study have good labour (unskilled) resources. However, Burma, Malaysia, Papua-New Guinea and Indonesia do not have an adequate supply of skilled labour for the wood

processing industry. Furthermore, the small number of skilled labour trained annually in these countries is usually attracted by better paid jobs in other industries, such as metalworking, plastics, chemicals, etc. (51). Unless remedied, this situation will impede the accelerated development of the wood processing industry.

7.2 Design, technical, supervisory and managerial skills

First-hand observations of several wood processing plants in the developing countries under study indicated the great need for upgrading the skills of technical, supervisory and managerial personnel. In most of the countries visited, product design and engineering is almost totally absent, particularly in the secondary sector of the industry. Efficient operation and management of wood processing plants, as in other types of manufacturing endeavour, is highly dependent upon the level of training of its supervisors, managers and technical support staff. Development and further improvement of the product is also highly dependent upon the ability of product designers and engineers to maximize utilization of available resources and to meet market specifications. Regrettably, these aspects of manufacturing operations have been unwisely neglected in the wood processing industry of most of the developing countries under study.

The same survey of the wood processing industries revealed that existing training facilities for skilled labour of the industry are not fully utilized or non-operational primarily due to lack of funds and/or trainers (44). Malaysia and Indonesia have more recently sought assistance from the more industrialized neighbouring countries and UNIDO to train or upgrade supervisors and managers for its industry.

7.3 Technology, research and development requirements

Research and development activities for the wood and wood products industry in the developing countries under study are principally conducted by government institutions or agencies. A survey of these research and development facilities (44) indicated that they all suffer from the following common problems:

(i) Inadequate funds available to carry-out more extensive and intensive work;

(ii) High turnover of qualified research personnel; and

(iii) Lack of programmes to solve industrial problems.

Furthermore, the prevailing situation indicates minimal communication between research institutions and industry, such that these institutions are looked upon by industry more as a tax burden than a source of potential benefit for the industry.

Privately owned land and operated research and development organizations also exist in the countries under study. Their activities, however, are oriented towards the immediate and long range needs of the firm and the results of their endeavour, of course, are hardly available to the industry, in general.

The situation in the developing countries under study thus calls for more participation from industry in terms of funding and more frequent dialogues with research and development institutions.

III. REQUIREMENTS FOR PROMOTING ACCELERATED DEVELOPMENT OF THE WOOD PROCESSING INDUSTRIES IN ASIAN DEVELOPING COUNTRIES

8. The wood processing industry of Japan

Both the primary and secondary sectors of the wood processing industry of Japan are very well developed (4). While the secondary sector has been domestic-oriented (Japan is a net importer of secondary wood products), the primary sector, particularly the plywood milling industry, had been predominantly export-oriented, but has lately become more domestic-oriented as a result of the increased local demand for the product (2), (71).

However, the wood processing industry of Japan has been greatly dependent upon timber imports during the last 10 years. Latest projections (1980) indicate the need for Japan to import 61 per cent of its timber requirements in 1986, gradually decreasing to about 57 per cent by 1996 as a result of the expected increase in local timber production (41).

The USA recently banned the export of pine timber produced from federal lands. Canada has imposed restrictions on the export of softwood timber. The USA and Canada are major suppliers of softwood timber to the Japanese wood industry. The tropical timber rich countries of Southeast Asia, which had been supplying at least 31 per cent of the Japanese timber imports, have imposed severe restrictions on their timber exports, with the ultimate goal of a total ban. The timber supply problem of Japan may be more serious than has been projected, for the 1980 projections of timber supply and demand is mainly based on the success of the Japanese forest development programme, the results of which are not yet apparent (71).

These recent developments in the world timber supply have left Japan with two alternatives to assure adequate supply of its wood products requirements, namely:

(i) Use of acceptable substitutes (possibly Russian pine and larch) from still available sources, or wood substitutes (plastics, metal etc.) for some end uses;

(ii) Increased dependence for its wood products supply on the wood processing industries of the developing countries of Asia and the Pacific.

The following paragraphs address the constraints and suggested solutions to the problems that will arise when the timber-rich developing countries of Asia accelerate the development of their wood processing industries to supply the wood product needs of Japan and other timber deficit countries of Asia.

9. Transportation and infrastructure requirements

Brion (44) has pointed out the inadequacies of domestic transportation systems and infrastructures in the developing countries under study. The rate and magnitude of development of the wood processing industries in these countries as contemplated will definitely impose severe strains on the existing domestic transportation systems in the developing countries. Thus, land transportation systems in all developing countries under study will have to be improved to cope with the increased volume of timber that must be transported from the forest to the processing plants, and from the factories to export loading points or domestic market distribution centers. In some countries, like Indonesia, Malaysia and the Philippines, development of adequate domestic sea transport facilities will also be required, for the sources of timber in these countries are rather distant and more accessible to the processing centers by sea.

Salgo (65) has pointed out two major problems hampering efforts to reduce cost of transporting wood products from developing countries:

(i) Current packaging techniques are not conducive to bulk handling of the wood products;

(ii) Shore facilities for bulk shipment of the processed wood products are inadequate.

The same conditions were observed by Brion (44) during a survey of the wood industries of the countries under study early in 1982.

Accelerated development of the wood processing industry in Asian developing countries may be sustained only if the resulting products can be transported to the market (Japan, in this case) at economic cost levels. Since there is a definite advantage in bulk shipment of goods, locating wood processing plants so as to facilitate bulk shipment requires the special attention of industry planners. Currently, the system of transport via sea-going vans (containers) offers tremendous freight reduction potentials to both the primary and secondary sectors of the wood processing industry of the countries under study.

10. Trade promotion and marketing strategies

The major handicap of developing countries in marketing their wood products is the lack of knowledge of the market. This is readily observed in the plywood industry. The majority of plywood needs in Japan are 0.90 m x 1.8 m, with thicknesses of 12 mm or more. On the other hand, the plywood factories of the developing countries under study are geared for the production of 1.2 m x 2.4 m sheets with thicknesses less than 12 mm, which are principally required in the USA and Europe.

Takeuchi (71) has pointed out the cost saving features of producing 0.9 m x 1.8 m plywood sheets. Thus, successful entry and sustained supply to the Japanese market of plywood products from developing countries may be attained only if production is shifted to the smaller sheets.

More recently, the Southeast Asian Lumber Products Association (SEALPA) has announced its intention to promote and sell its products in the world market through conventional means rather than on a cartel basis. This augurs well for the development of the wood processing industry in the developing countries under study, for it is more likely that better promotion of processed wood products of developing countries in the Japanese market may be attained through bilateral arrangements between Japan and the developing country, in connection with redeployment of the Japanese processing capacity to the developing country.

Industry associations, like the SEALPA, the Asian Panel Products Federation (APPF), the Asian Federation of Furniture Manufacturers (AFFMA) and the Asian Furniture Industries Association (AFIA) will play a significant role in reconciling the trade practices and wood product distribution systems between Japan and the exporting developing countries.

Initially, the development of the secondary wood products industry in the developing countries under study should be geared for the domestic market. This strategy will provide ample time for the developing countries to acquire

and develop (to suit local conditions) the skills and technology required by furniture and builders' woodwork products in the Japanese market will be predicated on the ability of the developing countries to manufacture the products in conformity to Japanese standards and specifications, which are usually different from those accepted in the developing country.

11. Product choice, adaptation and development

11.1 Buildings and construction products

Malaysia and the Philippines have gained footholds in the international market for building and construction products (see table 9). The Philippine market for these products is mainly the USA, while the EEC is the principal market for Malaysian building and construction products. Thus, these two developing countries are in the best position to supply the Japanese market for these products. However, since building codes and construction practices in Japan differ from those in Europe and the USA, adjustments will have to be made by Malaysia and the Philippines on the specifications and quality levels of their products for them to be acceptable in the Japanese market.

11.2 Low cost housing programmes

Among the developing countries under study, the Philippines and Malaysia have attained some degree of success in their low-cost housing programmes (44). It appears that the technology they have thus attained puts the two countries in a position to export building and construction products made of wood.

Again, housing specifications in Japan are quite different from those in the two developing countries so that adjustments are required on the part of the latter.

It appears that wooden housing construction industry in the other developing countries under study will have to be developed for their respective domestic markets before they can enter the Japanese market.

11.3 Furniture and joinery industry

Teak furniture is well received in the Japanese market. Indonesia and Burma, from the viewpoint of raw material availability, should be able to enter the Japanese market for these products. However, they still lack the technology required to produce furniture products that will meet with acceptance in the Japanese market.

Technical problems in joinery, surface preparation and finishing caused by the differences in climate between Japan and the developing countries have caused the slow development of wooden furniture exports from the Philippines, Malaysia and Thailand to Japan and the Republic of Korea.

The domestic market for furniture and joinery products in China and India is so huge and their timber resources are limited, so that any plan to export these products to the Japanese market will require extensive studies and deliberation by the Chinese and Indian furniture industries.

Among the developing countries under study, Papua-New Guinea, with the least developed furniture and joinery industry, is in the weakest position to undertake accelerated development of its furniture and joinery industry.

Japan has provided some developing countries with technical and marketing assistance in the wooden furniture industry and other products made of wood, for example:

(i) Rangoon Furniture Factory - A leading Japanese furniture manufacturing and marketing firm has recently entered into an agreement with a Rangoon (Burma) furniture company to produce annually 4,000 sets of living room chairs, 6,000 sets of dining room furniture, 3,000 sets of outdoor furniture and about 1,000 tons of furniture components at an expected annual turn-over of US $1.9 million. The project was launched in 1982 with the following production targets:

Period	% of planned capacity
March 1983	40
September 1983	50
March 1984	75
March 1985	100

The factory is located in Rangoon, with a total area of 2,500 m^2. It is provided with its own sawmilling and kiln-drying facilities. The Japanese firm provided the technology component of the project, while the Rangoon firm supplies the raw materials (teak wood). Exclusive marketing rights to the project's output were given to the Japanese firm. The foreign currency requirements of the project were arranged by the Japanese firm through a loan granted by the Export-Import Bank of Japan to the Rangoon firm. The firm is 100 per cent owned by the government of Burma.

Burmese key personnel (6 men) were trained in Japan for six months under the supervision of the Japanese firm during the pre-operating stage of the project. The Japanese firm has sent six technicians to help erect the factory and train more Burmese personnel during the first six months of the operating period.

The project appears to be meeting with success during the early stages as the initial production target (40 per cent of capacity) has been attained early in March this year. The Japanese firm has also expressed optimism that succeeding production targets will be met.

The over-all plan is for the Rangoon firm to produce and supply the Japanese firm with furniture components initially. Sub-assemblies will be produced later, and the whole furniture will eventually be produced in the Rangoon factory.

(ii) Jakarta Cabinet Plant - About four years ago, similar arrangements were made between a Japanese and an Indonesian firm to produce stereo and television cabinets in Jakarta. The project has been

successful. The Indonesian firm has been supplying the Japanese partner with stereo and television cabinets without the assistance of Japanese technicians during the past three years.

(iii) Manila Woodworks Plants - Under arrangements similar to those entered into between Indonesia, Burma and Japanese firms, two woodworks manufacturing firms in the Greater Manila area were able to supply Buddhist altars (Butsodan) to the Japanese partners.

These examples of co-operative ventures point to the capability of woodworks and furniture firms in developing countries to meet Japanese standards and specifications, with technical assistance from Japanese firms. More of such ventures are to be expected if Japan decides to import most of its wood products requirements from the developing countries of Asia and the Pacific.

11.4 Other products

The increased dependence by Japan on the developing countries of Asia and the Pacific for its supply of processed wood products will also affect a number of firms in the secondary (and tertiary) sector which depend on byproducts or residues of the primary and other secondary sector plants for their raw material supply, a feature of the industry which contributes significantly to its overall high recovery rates from imported logs. Thus, the manufacture of such products as Japanese casks and kegs, wooden footwear, inner soles of shoes, wooden tubs, picture frames, etc. will have potential for development in the developing countries.

11.5 Product standards and specifications

As pointed out in previous sections of this paper, adjustments in product standards and specifications will have to be made by the developing country (and possibly on the Japanese side too) so that the new product will be acceptable in the Japanese market, contribute to the economic viability of the newly established or expanded industry and at the same time be marketable in the domestic market of the developing country.

12. Summary of steps for developing countries to take in order to accelerate development of the wood processing industry

To summarize, the following steps could be taken by developing countries of Asia and the Pacific in order for them to expand their wood processing industries:

(i) Obtain a reliable estimate of the domestic timber needs of the country;

(ii) Update the available estimates on timber resources of the country and determine the balance between domestic timber supply and demand;

(iii) Considering the overall economic development programme of the country, decide on the following:

  (a) Orientation of the development of the wood processing industry, whether domestic or export market oriented;

  (b) Which sector(s) of the wood processing industry should be the object of major development efforts.

(iv) Identify the products or product groups to be manufactured under the accelerated industry development programme and the corresponding target markets and product quantities;

(v) Rationalize, on the basis of the above findings and the observations and recommendations discussed in previous chapters of this paper, the development programme for its wood processing industry, with assistance from external sources, if necessary, and considering inputs other than timber required by the programme;

(vi) Determine the availability of other local resources required by the development programme and decide on which inputs have to be supplied from external sources and which could be adequately supplied by improving locally available sources (such as labour, research and development services, other industries allied to or supporting the wood processing industry);

(vii) Implement the development programmes, with assistance from external sources, if necessary, using some of the applicable mechanisms mentioned in previous chapters of this paper to obtain foreign assistance;

(viii) Set-up monitoring and control systems that will aid the speedy and economical implementation of the development programme.

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(9) Any other comments?

Name:
(in capitals) .....

Institution:
(please give full adress) .....

Date: .....